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FOOD FACTORS IN GASTRO-ENTEROLOGY. By DR. LAFAYETTE B. MENDEL . . . 297

OBSERVATIONS IN THE TERMINAL STAGE OF A CASE OF HEPATIC CIRRHOSIS. By FREDERICK M. ALLEN, M.D. . . . 307

THE DIAGNOSIS OF LATE SYPHILIS OF THE CENTRAL NERVOUS SYSTEM. By CHANNING FROTHINGHAM, M.D. . . . 312

THE MURMURS OF MITRAL STENOSIS AND OF AORTIC REGURGITATION. By HAROLD E. B. PARDEE, M.D. . . . 319

A COMPARISON OF MEDICAL CASUALTIES IN BRITISH AND AMERICAN TROOPS AT A GENERAL HOSPITAL IN FRANCE. By REGINALD FITZ, Major, M.C., U.S.A., and ALICE CUNNINGHAM . . . 328

OPERATION OF SPINAL DECOMPRESSION. By NORMAN SHARPE, M.D. . . . 335

PROMINENT FEATURES OF THE PSYCHONEUROSES IN THE WAR. By JOHN F. W. MEAGHER, M.D., Major, M.C., U.S.A. . . . 344

LOCALIZATION OF TUMOR METASTASES. By G. E. ARMSTRONG, C.M.G., M.D., LL.D. (Queens), D.Sc (Liverpool), and H. OERTEL, M.D. . . . 354

ISOLATION OF THE MENINGOCOCCUS FROM CASES OF SO-CALLED INFLUENZA. By Major ROGER KINNICUTT, M.C., U.S.A., and First Lieutenant CARL A. L. BINGER, M.C., U.S.A. . . . 360

ACCOUNT OF AN EPIDEMIC OF INFLUENZA AMONG AMERICAN TROOPS IN ENGLAND. By F. M. MEADER, M.D., Major, M.C., U.S.A., J. H. MEANS, M.D., Major, M.C., U.S.A., and J. G. HOPKINS, M.D., Captain, M.C., U.S.A. . . . 370

THE UNIDENTIFIED PANDEMIC DISEASE (INFLUENZA?). By DUDLEY ROBERTS, M.D., Major, M.C., U.S.A. . . . 397

PNEUMONIA AS A COMPLICATION OF EPIDEMIC INFLUENZA. By Captain A. V. BOCK, M.C., U.S.A., and Captain J. L. STODDARD, M.C., U.S.A. . . . 407

(Contents continued on page vi)

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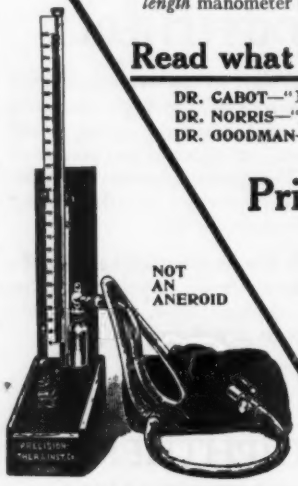

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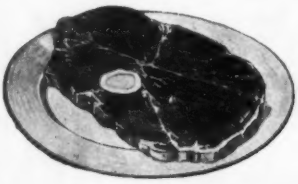

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CONTENTS

ORIGINAL ARTICLES

Food Factors in Gastro-enterology 297

By Dr. Lafayette B. Mendel, Professor of Physiological Chemistry in Yale University, New Haven, Conn.

Observations in the Terminal Stage of a Case of Hepatic Cirrhosis . . 307

By Frederick M. Allen, M.D., Diabetic Service, U. S. A. General Hospital No. 9, Lakewood, New Jersey.

The Diagnosis of Late Syphilis of the Central Nervous System . . . 312

By Channing Frothingham, M.D., Boston, Massachusetts.

The Murmurs of Mitral Stenosis and of Aortic Regurgitation 319

By Harold E. B. Pardee, M.D., Assistant Attending Physician, New York Hospital; Consulting Cardiologist, Mountainside Hospital, Montclair, N. J.; Formerly Captain, Medical Corps, U.S.A.

A Comparison of Medical Casualties in British and American Troops at a General Hospital in France 328

By Reginald Fitz, Major, U.S.A.M.C., Boston, Massachusetts, and Alice Cunningham, Secretary, United States Army Medical Department.

(*Contents continued on page 8*)

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334 Sutter St.
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ATLANTA, GA.
515 Hurt Bldg.
CHATTANOOGA, TENN.

Operation of Spinal Decompression 335
By Norman Sharpe, M.D., New York.

Prominent Features of the Psychoneuroses in the War 344
By John F. W. Meagher, M.D., Major, M.C., U.S.A., Neuropsychiatrist, U. S. A. B. H. No. 37, England; U. S. A. B. H. No. 214, France; U. S. A. General Hospital No. 30, Plattsburg Barracks, N. Y.; Clin. Ass't., Third Division, N. Y. Neurological Institute; Neurologist to St. Mary's Hospital, Brooklyn, N. Y., Etc.

Localization of Tumor Metastases 354
By G. E. Armstrong, C.M.G., M.D., LL.D. (Queens), D.Sc. (Liverpool), Chief Surgeon, Royal Victoria Hospital, and H. Oertel, M.D., Pathologist, Royal Victoria Hospital, Montreal, Canada.

Isolation of the Meningococcus from Cases of So-called Influenza . . 360
By Major Roger Kinnicutt, M.C., U.S.A., and First Lieut. Carl A. L. Binger, M.C., U.S.A.

Account of an Epidemic of Influenza among American Troops in England 370
By F. M. Meader, M.D., Major, M.C., U.S.A., J. H. Means, M.D., Major, M.C., U.S.A., and J. G. Hopkins, M.D., Captain, M.C., U.S.A.

The Unidentified Pandemic Disease (Influenza?) 397
By Dudley Roberts, M.D., Major, M.C., U.S.A., New York.

Pneumonia as a Complication of Epidemic Influenza 407
By Captain A. V. Bock, M.C., U.S.A., Boston, Mass., and Captain J. L. Stoddard, M.C., U.S.A., Boston, Mass.

REVIEWS

Rules for Recovery from Tuberculosis. By Lawrason Brown, M.D. . . 421
The Medical Clinics of North America 421
The Medical Clinics of North America 423
Surgical Treatment. By James Peter Warbasse, M.D. 424
The Blind: Their Condition and the Work being Done for Them in the United States. By Harry Best, Ph.D. 425

(*Contents continued on page 10*)

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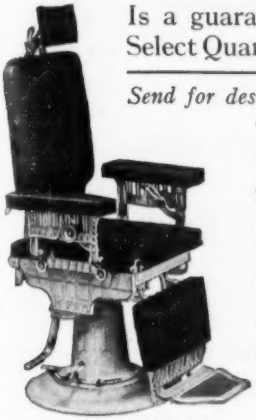

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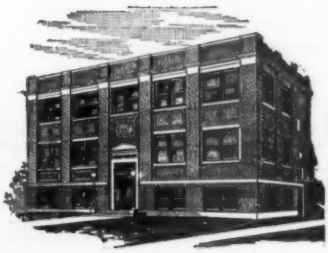

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Pye's Surgical Handicraft. By W. H. Clayton-Greene, B.A., M.B., B.C. (Camb.), F.R.C.S. (Eng.) 426
Outline of Genito-urinary Surgery. By George Gilbert Smith, M.D. . 426
Transactions of the Section on Genito-urinary Diseases of the American Medical Association 427
Transactions of the Association of American Physicians 427

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MEDICINE

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W. S. THAYER, M.D., ROGER S. MORRIS, M.D., AND THOMAS ORDWAY, M.D.

The Gastric Response to Foods. II. A Fractional Study of the Coagulation of Milk in the Human Stomach 428
Observations on Hyperglycemia and Glycosuria 429
Studies in the Mechanism of Absorption from the Intestine 430

PEDIATRICS

UNDER THE CHARGE OF

THOMPSON S. WESTCOTT, M.D., AND ALVIN E. SIEGEL, M.D.

Hypophyseal Dystrophy in Hydrocephalus 431
Bacillus Tuberculosis in the Tonsils of Children Clinically Non-tuberculous 432
Antiscorbutic Properties of Fruits (an Experimental Study of Dried Orange Juice) 433
The Acidotic State of Normal Newborns 434
Protein Milk Powder 434
Tumor of the Brain 435
The Etiology and Treatment of the Diarrheal Diseases of Infancy . . 435
Autoserum Treatment of Chorea 436

(*Contents continued on page 12*)

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CONTENTS—(*Continued*)

OBSTETRICS

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.

Extraperitoneal Cesarean Section in Infected Cases with the Carrel After-treatment 436
Obstetrical Anesthesia during Labor 437
The Effect of Placenta on the Growth of the Fetus and the Newborn Child 437
Obstetric Science and Art in the Service of the Nation 438
An Operation for the Relief of Pyloric Obstruction in Infants 439
A Method for Determining the Maturity of the Fetus in Utero 439
The Clinical Types of Puerperal Fever with Reference to Prognosis and Treatment 440
The Abuse of Pituitary Extract in Obstetric Practice 441
A Case of Abdominal Pregnancy at Term 441
Fetal Deaths During Labor 442
Prevention of Gas Pains after Obstetric and Other Operations 444

GYNECOLOGY

UNDER THE CHARGE OF

JOHN G. CLARK, M.D., AND FRANK B. BLOCK, M.D.

Permanent Rectal Cloaca 445
Tuberculosis of the Cervix 446
Vaginal Hernia 447
The Menopause 448

(*Contents continued on page 14*)

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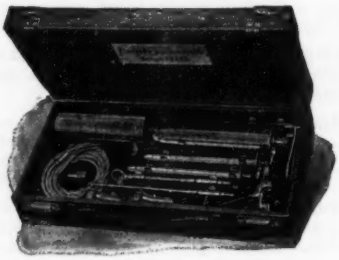

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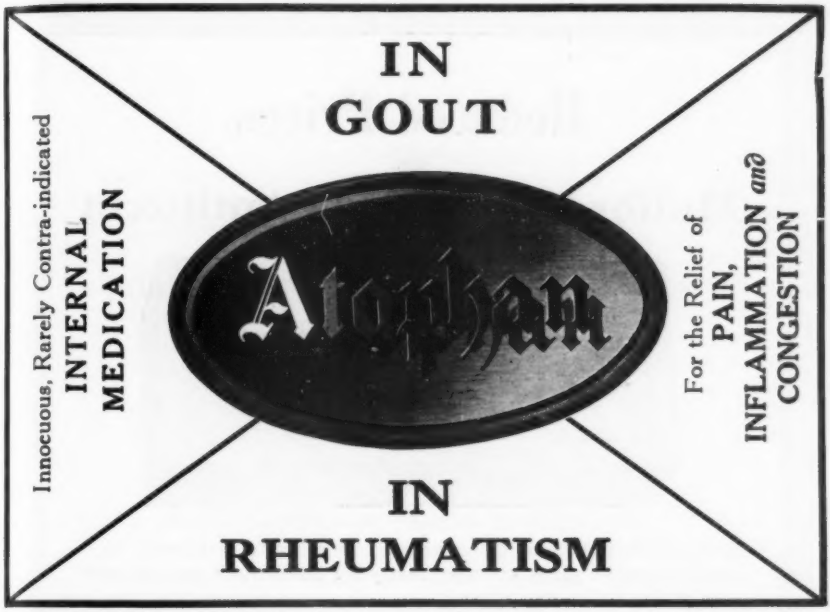

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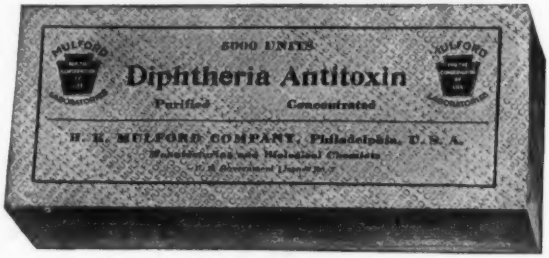

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THE

AMERICAN JOURNAL

OF THE MEDICAL SCIENCES

SEPTEMBER, 1919

ORIGINAL ARTICLES

FOOD FACTORS IN GASTRO-ENTEROLOGY,[1]

By Dr. Lafayette B. Mendel,

PROFESSOR OF PHYSIOLOGICAL CHEMISTRY IN YALE UNIVERSITY, NEW HAVEN, CONN.

If one were to interpret the present-day scope of gastro-enterology from the contents of the papers which were presented at the last annual meeting of this Association, it would, I suspect, be difficult to find a place therein for a topic such as I am venturing to discuss at this time. It seems to me, however, that a discipline which relates to "the normal and pathological conditions of the digestive organs" cannot fail to find some interest in the role of the food, for the transformation and transport of which these organs exist, or in the phenomena of nutrition, for which the function of digestion is an indispensable preparation.

There are growing manifestations of a more lively interest on the part of the so-called clinical worker in the contributions of the scientific investigators of the laboratory. It is a platitude to remark that no detail of the fundamental physiology and biochemistry of the alimentary processes should be deemed too insignificant to deserve consideration from the gastro-enterologist. The modern researches on the movements of the digestive canal, the secretions which reach it and the chemical changes which proceed within it are finding applications in diagnosis and therapy of gastro-intestinal disorders. Unfortunately, rational dietetics founded upon the newer knowledge of the chemistry of foods and nutrition has not yet received the discriminating study and advocacy on the part of practical clinicians that its importance unquestionably warrants.

[1] Read at the meeting of the American Gastro-enterological Society, Atlantic City, June 9, 1919.

We may frankly admit that dietetics is at present far from being an exact science, so that dietotherapy is anything but an accurate art. Nevertheless, the limitations of our knowledge, based, in part, on empiricism and modified by that factor of uncertainty described as personal idiosyncrasy, need not disparage the recourse to novel therapeutic viewpoints and new procedures which new scientific facts are likely to initiate when they are given a sympathetic hearing.

The current attitude of aloofness from sane and helpful dietetics in medical practice is largely engendered by ignorance and indifference, conditions which the recent progress in this field should help to dispel. The widely divergent methods now in vogue in the treatment of gastric ulcer—methods which range from enforcement of complete physiological inactivity and absence of food in the upper alimentary tract, as the one extreme, to liberal feeding, intended to secure better healing through improved general nutrition, as the other extreme—illustrate the place which a fundamental understanding of food factors should have in rational gastro-enterology. Indeed, there are few, if any, specialized departments of medicine which would fail to benefit by greater attention to the fitness of the body as a whole. The physiological functions are so widely correlated and interdependent that there is oftentimes danger of overlooking the major advantage because of a concentration of attention upon a more obvious minor defect.

Food and Disease during the War. The exigencies of the World War and the unusual food situations created by it have compelled thousands upon thousands of persons to alter their traditional modes of nutrition or their customary dietary habits. This change has not been instituted without many protests. Even the finest spirit of patriotism could not always repress misgivings regarding the physiological wisdom of the enforced or recommended innovations of diet. All physicians, probably, can substantiate my assertion that the medical profession received many anxious appeals to corroborate the alleged safety of the dietary restrictions which the governments demanded in the interest of the win-the-war policy. Many of the proposals cost the responsible officials of our Food Administration no little anxiety lest the substitutions and economies and the food sacrifices and modifications of diet might in any way alter the well-being of our population. During the war we have learned the possibility of using more than one cereal to advantage; we have succeeded in lowering the consumption of meat without apparent detriment; we have reduced the intake of sugar to the plane where it represented a condiment rather than a food; we have restored the conserved and less expensive vegetables to a worthy place in the day's food—these and other dietary changes have been instituted amid the fears of the devotees of custom in foods.

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It must not be assumed, however, that the enforced war-time restrictions have been attended everywhere with equal nutritional success. The effects of the difficulties in the food situation in the Central Empires of Europe upon the health of their peoples have recently been reported by a no less competent observer than Prof. F. Kraus,[2] of the Charité Hospital in Berlin. Addressing the members of the medical profession, he referred, in the domain of gastro-enterological disorders, to the numerous cases of intestinal dyspepsia provoked by the monotonous, voluminous diet preponderating in difficultly digestible carbohydrates; to the gastric dyspepsias attended with achylia, less often with diarrhea; to the intestinal fermentations; above all to the induced constipation, flatulence and the induced or augmented catarrhal condition of the bowel; and likewise to an increased incidence of ulcer. Furthermore, Kraus alleged that, among numerous persons in all walks of life, the monotony of the crude diet, the lack of gustatory stimuli and suitable food accessories, and possibly of vitamines, have induced a degree of anorexia or food satiety which has ultimately been followed by inanition. Surely the recital of these untoward experiences affords a cogent argument for a better appreciation of the specific role of the individual nutrients not merely in the physiology of digestion, but also in the clinic of gastro-enteric disease.

Some Newer Viewpoints. If we turn to the innovations of viewpoint which the newer physiology offers as worthy of the attention of the gastro-enterologist the modern conception of secretion becomes conspicuous. Twenty years ago, when this Association was still in its infancy, the mechanism of the control of the glandular activities, which are so important in relation to alimentation, was believed to reside in the nervous system. Secretion was conceived to be initiated or inhibited, as the case might be, through the medium of nervous impulses. Today a humoral path of stimulation through the intermediation of chemical substances—hormones or succagogues carried in the blood stream—is becoming well recognized. I cannot but believe that if the various chemical stimulants to secretion, particularly as they occur in our diet ingredients, were better known and appreciated the information would find more frequent application, particularly in relation to the promotion of gastric secretion. It is not too much to hope that selected foods and related substances may before long be expected to accomplish for secretion some of the effects which drugs are at present often called upon to bring about.

Vitamines and Gastro-enterology. The word "vitamine," scarcely five years old, has already become an expression to conjure with. The vague and mysterious characteristics with which it is at present endowed will, I feel confident, gradually acquire a more

[2] Berl. klin. Wchnschr., January 6, 1919, p. 3.

specific significance as the potencies of "the hitherto unidentified food factors indispensable to normal nutrition" are elucidated by further research. Consider the following striking experimental demonstrations: An animal is placed upon a diet consisting of isolated proteins, carbohydrates, fats and inorganic salts—the traditional mixture of nutrients which the physiology of our teachers has led us to expect to be adequate for the body's needs. Nutritive failure and decline will inevitably ensue, attended by a variety of symptoms, perhaps including those seen in beriberi. An exceedingly small dose of brewers' yeast or a chemical fraction prepared therefrom, or a small allowance of a vegetable like the tomato, spinach or carrot, or an addition of milk or of any of a large variety of naturally occurring foods to the dietary, will bring a restitution of health with a speed and completeness that is little short of marvellous. We are face to face in such instances with the nutrition-promoting potency of something which cannot be expressed in terms of the hitherto recognized nutrients. A ration compounded of washed skeletal muscle (beefsteak), carbohydrate, fat and salts leads to analogous nutritive failure; whereas, the substitution of liver or kidney tissue for the meat, in an otherwise unaltered diet, ensures uninterrupted well-being. In terms of the current hypothesis we have become accustomed to say that the yeast, the vegetables, the milk, liver, and kidney contain an essential food factor or vitamine.

Again, if in an otherwise adequate dietary the sole source of fat is represented by lard or one of the familiar vegetable oils, nutritive disaster will ensue sooner or later. During the period of pronounced malnutrition serious eye disease may arise as one of the intercurrent symptoms. The introduction of a small amount of milk fat, liver fat (as in cod-liver oil) or the oil of some of the vegetables, as Osborne and I have lately demonstrated, brings about an almost magical restitution of health. Here evidently we are concerned with the presence in certain of the fats or fat-like mixtures of another potent property distinct from the vitamine already described. To these illustrations, so striking that they are not easily forgotten by one who has witnessed the surprising remedial transformations induced by seemingly insignificant quantities of certain food products, may be added the presumably distinct antiscorbutic properties of certain natural foods.

The purpose of these fragmentary references to significant features in the recent studies of nutrition is not to emphasize primarily their broader dietary significance. I desire rather to offer the suggestion that dietary deficiencies, such as are exemplified by the lack of suitable vitamines in the ration, may affect the gastro-enteric tract quite as probably as other parts of the organism which are represented in the now recognized so-called deficiency diseases. The gastro-intestinal symptoms in pellagra afford a specific illustration.

At the present stage of our knowledge the gastro-enterologist cannot afford to overlook the possible role of the vitamines in the functions of those parts of the organism with which he is most directly concerned.

In a recent interpretation of the nature of appetite Carlson[3] wrote:

"Appetite depends not only on the memory process of past experience, with palatable food as positive phases and the memory process of removal of hunger pangs by feeding, but the presence of this memory process in consciousness depends on certain conditions of the alimentary tract. When the stream of afferent impulses from the alimentary tract and possibly other visceral organs becomes altered in quantity or quality from the normal these impulses suppress or render impossible the existence of appetite. Hence it would appear that the existence of appetite is an indication of a proper condition of the alimentary tract to handle the food in the way of motility and secretion, and that this is the chief biological significance of appetite. The production of appetite gastric juice is of secondary importance and of practical significance only in cases of extreme impairment of gastric secretion."

We have frequently observed that one of the conspicuous manifestations of a dietary regimen deficient in certain types of vitamines is a diminished food intake. The feeding of vitamine-containing products almost always results in an improved appetite, if one may judge this by the resulting ingestion of increased amounts of the same ration which was refused on the vitamine-free regimen. Precisely what the decisive relationships here are—whether improved appetite induced by the vitamine leads to better food intake and hence better nutrition or whether nutrition improved by the potent food factor results in better appetite—can scarcely be decided at the present time. At any rate the possible bearing of vitamines on the problem of appetite and alimentary well-being should not be overlooked by those who are interested in the physiology and pathology of the gastro-enteric tract.

Protein Factors. In considering the role of albuminous substances in nutrition the gastro-enterologist is confronted with the unlike digestibility of proteins from different sources. Thus the proteins of some of the legumes, notably beans, are admittedly more resistant to the enzymatic digestive changes than is the case with proteins from many other sources of both animal and vegetable origin in the alimentary canal. Why this is true remains to be elucidated. The tendency for native egg-white to be poorly utilized in the digestive tube has been emphasized by the investigations of Bateman[4] in our laboratory. He has summarized the objections to

[3] New Aspects of the Significance of Appetite and Appetite Gastric Juice in Practical Medicine, Interstate Med. Jour., 1917, No. 5, vol. xxiv.

[4] The Use of Raw Eggs in Practical Dietetics, Am. Jour. Med. Sc., 1917, cliii, 841.

the use of raw eggs, which is still widely advocated by some physicians, as follows:

"A substance which fails to stimulate a flow of gastric juice and is antipeptic, which hurries from the stomach, calls forth no flow of bile and strongly resists the action of trypsin, which is poorly utilized and may cause diarrhea, has evidently little to recommend it as a foodstuff of preference for the sound person, let alone for the invalid. And when the native protein needs only to be coagulated at 70° in order to obviate almost all the effects mentioned, there appears still less reason for using it uncooked. Other considerations strongly support this conclusion."

Another illustration of the resistance to digestion on the part of a protein substance, presumably complete in its chemical make-up, is furnished by wheat bran. If further evidence were needed to demonstrate the failure of its protein to be utilized one could cite the latest experiments on man by Holmes.[5] Even when wheat bran was ground very fine so as to be rendered more pervious to the digestive secretions the "coefficient of digestibility" did not exceed 45 per cent. Indeed, the advocacy and success of wheat bran as a laxative is based in part at least on this resistance to alimentary digestion.

The three instances just cited exemplify the objections to the use, as nutrients, of protein products known to be difficultly digestive because of either chemical composition or physical texture. Such foods must often be excluded in dietotherapy when an undigested alimentary residue, susceptible to microbial changes, with the possible attendant symptoms of intestinal disorder, needs to be avoided. On the other hand it must not be assumed that every protein which is digested with great readiness and completeness in the alimentary tract is on this account an ideal component of the ration. Gelatin is conspicuous for the readiness with which it yields to the proteolytic enzymes of the intestinal canal; despite this easy digestibility, however, it is an "incomplete" protein in the sense that it fails to furnish some of the amino-acids that are indispensable for perfect nutrition. This fact has long been known; and while the use of gelatin as a supplementary food can only be commended, its limitations as the sole source of nitrogen deserve to be reiterated at a time when a concerted effort is apparently being made to increase the consumption of the product.

Again, there are instances of proteins or protein mixtures which are not absolutely defective or incomplete in the sense referred to in the discussion of gelatin, yet are comparatively deficient in the yield of certain "building stones" essential for nutrition. Thus the proteins of wheat flour are easily digested and utilized in the usual sense. Compared with many other proteins, however, they are not economical sources of the nitrogenous nutrient units. Osborne and

[5] Experiments on the Digestibility of Wheat Bran in a Diet without Wheat Flour U. S. Dept. Agric., Bull. 751, 1919.

I[6] have recently demonstrated that flour used as the sole source of protein is inferior to many other foods in maintaining adult rats, and especially in promoting the growth of the young. But when the proteins of wheat are fed in combination with about one-third of their weight of the proteins furnished by eggs, meat or milk these cereal proteins are so greatly enhanced in value that flour is thus used most advantageously. In fact, by far the greater part of the flour used in this country in every-day life is actually eaten in combination with those food products which successfully supplement the nutritive deficiencies of its proteins. Adequate nutrition means something more than calories and digestible nutrients; the components of the diet must be appropriate in quality as well as quantity and all of the essential units must be represented.

The Inorganic Elements. In a recent text-book it is stated:

"The mere enumeration of a few of the important uses of the inorganic elements brings out strikingly their significance. The multiplicity of their function has likewise rendered the study of these substances difficult, for with one element having a varied function its removal from the diet may be responsible for many secondary reactions which will mask the direct result.[7]"

Despite such generalizations it must be admitted that our knowledge of the functions of the inorganic elements in the body is still very fragmentary and indefinite. As Osborne and I have written elsewhere:[8] "Although there is almost unanimity of opinion regarding the energy needs of the body under different circumstances of age and activity; although the current estimates of the minimum amount of protein required per day seem to be defined within reasonably narrow limits; although the functions of fat and carbohydrate and the possibilities of their interchange are beginning to be understood; there is no adequate experimental basis whatever to permit tenable statements regarding either the indispensability or the minimum requirement of any of the inorganic constituents of the dietary, with the possible exception of calcium and phosphorus. Statistics show enormous divergencies between the mineral intakes of people in different regions; but these appear to be the fortuitous results of widely unlike dietaries, including water (as is the comparative dissimilarity in the fat and carbohydrate content of the diets of peoples living respectively in a tropical or frigid climate—differences enforced by the unlike character of the available food supplies) rather than the expression of unlike metabolic needs. A beginning has hardly been made in this field of investigation."

The need of certain elements for structural purposes in the body

[6] The Nutritive Value of the Wheat Kernel and its Milling Products, Jour. Biol. Chem., 1919, xxxvii, 557.

[7] Carter, Howe and Mason: Nutrition and Clinical Dietetics, Lea & Febiger, 1917, p. 78.

[8] The Inorganic Elements in Nutrition, Jour. Biol. Chem., 1918, xxxiv, 131.

is obvious. The possible part which some may play in the obscure role of "maintaining osmotic equilibrium" is less certain, and when the assumed balance of acids and bases is discussed the border-line of accurate knowledge respecting the individual elements is reached. In studying growth under conditions in which the specific inorganic content of the ration could be fairly well controlled, each element being increased or diminished as desired, Osborne and I found that a lack of calcium or phosphorus promptly effects untoward results. The need of the other familiar inorganic elements, however, appeared to be unexpectedly small. This applied particularly to chlorin, and is presumably true of some of the other elements like sodium, potassium and magnesium. As we have pointed out: "That these may to some degree be essential to the adjustments of neutrality regulation is indicated by the failure to grow when both sodium and potassium were practically excluded from the diet, whereas growth was nearly or quite normal when only one of these elements was missing. That these elements take part in the processes regulating the neutrality of the body fluids is to be assumed from what has been learned by experimental work *in vitro* along these lines, and also from the fact that our experiments with diets essentially free from both sodium and potassium have led to nutritive failure." We concluded that in the long run much smaller quantities of those inorganic elements which can be husbanded will be required for well-being than of those which are needed for the maintenance of neutrality, and hence are continuously eliminated, wholly apart from any quantity necessary for the construction of special tissues like bone or for the production of milk.

The gastro-enterologist is peculiarly interested in the role of chlorin in the organism because of the indispensability of this element in the elaboration of the gastric juice. Common salt has frequently been prescribed to supplement diets presumably poor therein, with the avowed object of averting any failure of hydrochloric acid secretion, particularly because anacidity has been reported as a consequence of a salt-free diet. It must now be borne in mind, however, that when the intake of chloride is restricted the output promptly decreases. In starvation it is almost *nil*. Whatever chlorin is secreted into the stomach is subsequently reabsorbed and consequently conserved. The feces in health carry away little if any chloride. Referring to observations on man, Sherman states that even when there was complete deprivation of salt during ten to thirteen days the total loss did not exceed 10 to 15 per cent. of the amount estimated as usually present in the body. Rosemann has demonstrated that a diet deficient in chlorides leads at most to an insignificant reduction of the total chlorin content of the body in animals. Excretion of the element stops under such conditions, but signs of malnutrition are speedily elicited when chlorin is withdrawn from the body by actual removal of the hydrochloric acid of the

gastric juice through a fistula. Until losses are thus artificially enforced the gastric juice tends to maintain essentially its normal content of hydrochloric acid.

The ability of the animals, which Osborne and I observed, to continue in health for a time on a diet low in chlorin might therefore have been anticipated; but, as we have remarked elsewhere, it could not have been expected that they would continue to thrive so long or attain so many times their original weight on such an extremely low chlorin intake. The outcome of these experiments cannot be due to substitution of other anions for chlorin but is attributable to a husbanding of this specific element. From the therapeutic standpoint the demonstration that a growing animal can fully supply from inorganic sources its requirements of the inorganic elements emphasizes anew that it is unnecessary to consider the presence of calcium, phosphorus and iron, for example, in natural foods to the degree that is currently believed.

Food and the Intestinal Flora. There are times when the bacterial invaders of the alimentary tract give much concern to the gastro-enterologist. It is, of course, true that microörganisms are always harbored in the recesses of the bowel, but the intestinal flora is by no means a constant one. On rare occasions specifically pathogenic bacteria are present. Under ordinary circumstances the types include more familiar putrefactive organisms, on the one hand, or acidophile bacteria, on the other. Herter and his associates were the first to demonstrate clearly the dependence of the types of bacteria developing in the alimentary canal upon the chemical character of the diet. In general it may be said that abundance of carbohydrates tends to favor the preponderance of the acid-forming types, whereas proteins permit the appearance of putrefying bacteria. Thus one may recall Torrey's observations on the effect of various high-calory diets upon the fecal flora of typhoid fever patients. It was shown by him that with some cases if lactose were added in amounts of 250 to 300 grams a day to the other ingredients of the Coleman-Shaffer diet there resulted a transformation of the fecal flora from the ordinary type to one strongly dominated by B. acidophilus. As an added illustration of the fundamental way in which the types of bacteria vegetating in the intestine can be controlled by the chemical character of the food ingested I shall quote from the more recent studies by Torrey:[9]

"In feeding experiments with dogs it has been shown that two carbohydrates, lactose or dextrin, when added to a meat and rice diet caused such a marked development of aciduric bacteria of the B. acidophilus type that they completely dominated the fecal flora and effected the almost complete suppression of proteolytic types commonly found in the canine intestinal tract, even including B. coli.

[9] The Regulation of the Intestinal Flora of Dogs through D et, Jour. Med. Research 1919, xxxix, 415.

This purely fermentative flora would, furthermore, persist as long as the diet was continued, there being no tendency to reversion to the so-called normal flora. B. bifidus sometimes increases greatly under these dietary conditions, but generally was soon overgrown and suppressed by B. acidophilus, and, in fact, very rarely became the dominant type. A diet of bread and milk, which naturally contains both lactose and dextrin, was also followed by the establishment of a fecal flora consisting almost entirely of B. acidophilus."

Again, Torrey writes:

"Starchy foods all tended to effect a simplication of the intestinal flora and an elimination of obligate putrefactive bacteria. These foods with a large starch content differed in some degree in their efficiency as transforming agencies. White bread, potatoes and beans all tended to bring about a predominance of B. acidophilus, whereas rice proved rather less effective as an antiputrefactive agent."

And of the protein factor Torrey has this to say:

"Various proteins were found to differ radically in their effect upon the intestinal flora, depending upon their source. Of the varieties tested the proteins of mammalian tissues were the only ones which markedly encouraged the growth and activity of the obligate putrefactive bacteria within the intestinal tract. A diet of fish brought to development a flora which was entirely different from that appearing in association with the feeding of beef hearts. Spore-bearing bacteria did not appear in the fecal specimens in more than insignificant numbers. There was a notable absence of the B. welchii types which constitute so large a part of the flora in connection with a meat diet. On the other hand, bacteria of the B. coli and B. proteus types were strongly predominant. Milk casein as an article of diet exhibited far less tendency to give rise to intestinal putrefaction than did meat protein. . . . Vegetable proteins stand in strong contrast to animal proteins, especially meat, in that they do not offer the slightest encouragement to the growth of intestinal putrefactive types of bacteria. In fact, with a bread containing a very high protein content with a minimum of carbohydrate as marked an overgrowth of aciduric intestinal bacteria occurred as was observed in connection with diets to which considerable amounts of lactose or dextrin had been added."

It is needless to multiply quotations. They are concordant in suggesting that diet can probably be made a more potent factor than are ingested bacterial cultures in regulating putrefactive conditions in the bowel. The determination of the conditions under which desired intestinal floras can be established opens a fruitful field for the clinical investigator.

Dietetics offers no cure-alls to the gastro-enterologist, nor does any other mode of therapy. Calories, proteins, vitamines, acidophilic bacteria—these merely furnish viewpoints from which impor-

tant problems of practice may be examined. The student of foods and nutrition is wont to be reminded that "a little knowledge is a dangerous thing." This is doubtless true, but I cannot gain the conviction that utter ignorance is a safety device. My sole justification for presenting a consideration of some food factors in nutrition has been the hope that the fragmentary items hastily reviewed may perchance suggest new possibilities in the practice of gastroenterologists. Huxley once wisely remarked that science commits suicide when it adopts a creed. The open mind continually receptive to new suggestions guarantees a more healthful life.

OBSERVATIONS IN THE TERMINAL STAGE OF A CASE OF HEPATIC CIRRHOSIS.

By Frederick M. Allen, M.D.,

DIABETIC SERVICE, U. S. A. GENERAL HOSPITAL NO. 9, LAKEWOOD, NEW JERSEY.

The patient in question was a private, aged twenty-nine years, born in Italy, and a barber prior to being drafted into the military service. His father died at fifty-nine of unknown cause. His mother, one brother and three sisters are alive and well. He gave a history of measles in childhood, chancre or chancroid six years ago, for which he received two salvarsan and two mercury injections at the time, and gonorrhea three years ago.

Otherwise he was well until a left inguinal hernia appeared two years ago and one on the right side six months later. He was admitted to the hospital July 28, 1919, for operation, and the examinations on the surgical service showed nothing wrong except the hernias. He deserted August 7, was brought back August 29 and the hernias were repaired by Andrews' method under ether on September 3. Very large scrotal hematoma ensued, and on account of persistent oozing a coagulose injection was given on September 6. The wounds broke down and healed slowly by granulation, with return of the hernias. Large quantities of blood were passed by bowel on the days following operation. Fluid accumulation in abdomen coming on during this time was assumed to be due to hemorrhage. October 21 to 28 the patient went through typical influenza, which was then epidemic in the hospital. On the medical service the abdomen was tapped November 6, removing 7500 c.c. clear fluid, which gave a two-plus Wassermann reaction. Careful physical examination revealed nothing abnormal except a distinctly palpable spleen; the liver was not enlarged. Investigation was interrupted by the escape of the patient on November 8, due to his feeling so well after tapping. He was brought back February 19,

1919, in advanced weakness and emaciation, with slight icterus and large ascites present. He stated that he had been in bed most of the time while absent and that a local physician had tapped his abdomen eleven times and treated him with salvarsan, mercury and potassium iodide. Though negative Wassermann tests were obtained in blood and ascitic fluid, mercury and iodide were vigorously pushed in the hospital. A summary of other laboratory reports on various dates is as follows:

Ascitic fluid clear, pale straw color; no bile; specific gravity, 1010; albumin, 6 gm. per liter. Cell count 32 per field; many lymphocytes, few peritoneal cells. No bacteria in smear. Culture sterile.

Urine: Normal at first. After February 20 traces of albumin; many hyalin and granular casts; positive guaiac, 20 to 30 pus cells and 200 to 300 red corpuscles per field. Bile negative.

Blood: Hemoglobin, 65 per cent. on October 23. Red count 3,470,000 on October 3; 4,340,000 on October 23; 3,960,000 on February 20. Leukocytes, 4500 to 11,000; polymorphonuclears, 67 to 71 per cent.; large mononuclears, 5 per cent.; small mononuclears, 16 to 24 per cent.; transitionals, 3 to 6 per cent.; eosinophiles, 2 per cent. Red cells show achromia, anisocytosis and poikilocytosis, but no polychromatophilia. No normoblasts or megaloblasts. Blood platelets normal in number. Clotting time, two minutes forty-five seconds. Bleeding time, eight minutes, thirty seconds. No digestion of clot after twenty-four hours.

Feces negative for blood and otherwise on October 22.

On March 2, 10 liters of straw-colored fluid was removed from the abdomen without completely emptying it. The patient continued to appear about the same and was eating regularly until he passed unexpectedly into coma on the night of March 7–8.

The above records were all made in other wards. At 10 A.M. on March 8 the patient, in full coma, with marked hyperpnea, was transferred to the diabetic ward. Rectal temperature, 97° F. Pulse, 96. Blood-pressure: 90 systolic and 60 diastolic. Respiration 24, very deep, audible, typical air-hunger character. Lumbar puncture was performed at 10.30 A.M. to relieve possible pressure and also with a view to Wassermann and other tests, but in repeated attempts only a few drops of fluid contaminated with blood were obtained. Other procedures were as follows:

11 A.M. Catheterization. Urine amber, turbid.

11.20. Paracentesis abdominis. Fluid clear, pale straw color. Peritoneum not emptied. Cannula left in place.

11.45. Blood-pressure, 102—75. Injected into peritoneum through cannula 3 liters of solution containing 0.85 per cent. NaCl and 10 per cent. glucose. Cannula still left in place, with clamped tube attached.

A series of blood-pressure readings thereafter were 110 to 115 systolic, 70 to 75 diastolic. There was distinct strengthening and

reviving effect, so that the patient moved and opened his eyes about an hour after the injection; but consciousness was not regained, dyspnea persisted unchanged and the strength again gradually failed.

2.30–3 P.M. Intravenous injection of 500 c.c. 5 per cent. glucose solution.

3.30 P.M. Peritoneum emptied as completely as possible through the cannula, which was then withdrawn. Fluid water-pale.

4.00 P.M. Cathererization. Urine lighter colored than before.

4.30. Blood-pressure, 110–70.

5 P.M. Blood-pressure, 85–60.

As the weakness was at a dangerous point, 500 c.c. 5 per cent. glucose solution in distilled water was again injected intravenously. A reviving effect was perceptible, but very slight and transitory, and the decline continued.

7.15 P.M. Blood-pressure, 65–40.

11.50 P.M. Heart and respiration ceased.

Autopsy was performed by Lieut. J. W. Sherrill. It showed, in summary, some old left-sided pleural adhesions and slight apical tuberculosis of the left lung; a small, hard, hobnailed liver weighing 1125 grams, with thickened capsule and grayish-yellow color, nearly bloodless; an abnormally large and firm spleen weighing 610 gm., with thickened opaque capsule; kidneys and other viscera apparently normal. The slight yellowish tinge of skin and conjunctivæ was held to be not true icterus. The peritoneum still contained 3 liters of clear pale fluid. Careful search was made in the brain, lungs and coronary circulation for embolism or thrombosis and no anatomical cause of acute death was found anywhere. Microscopic sections of the principal viscera showed no important abnormalities except in the spleen and liver. In the spleen nothing was noticed except a less marked increase of connective tissue than was anticipated from the gross appearance. The liver was typical of advanced portal cirrhosis, and neither the gross nor the microscopic picture showed anything of the usual appearances of syphilis. It may be added that the clinical record never warranted a positive diagnosis of syphilis.

CHEMICAL EXAMINATIONS. These were carried out by the staff of the diabetic laboratory. The blood plasma showed no perceptible bile color and bile tests remained negative in the urine. Every specimen of plasma and urine was tested with nitroprusside, with negative results; and particularly to rule out the possible presence of β-hydroxybutyric acid alone, each specimen was run through the Van Slyke method for total acetone, no precipitate being obtained before or after adding bichromate. The figures for ammonia and total nitrogen in the urine have been lost, but it can be stated from memory that the ammonia was at a low normal level, and there was nothing remarkable in the total nitrogen either in

absolute output or any unusual discrepancy between it and the urea. The other chemical data are as follows:

BLOOD RECORD.

Time.	Plasma sugar, per cent.	CO_2 vol., per cent.	Urea, mg. per 100 c.c.	Chlorides gm. per liter.	Corp., per cent.	Total fat.		Cholesterol.	
						Whole blood, per ct.	Plasma, per ct.	Whole blood, per ct.	Plasma, per ct.
9.00 A.M.	0.175	37.5	40.8	6.29	31.0	3.07	3.63	0.25	0.27
2.30 P.M.	0.600	38.5	...	...	28.9				
3.30 P.M.	1.000	25.8	...	...	29.6				
9.30 P.M.	0.638	23.3	...	...	27.2				

URINE RECORD.

	Volume, c.c.	Sp. gr.	Sugar, per cent.	Nitroprusside.	Urea, per cent.	Chlorides, per cent.
11.00 A.M. By catheter	375	1.029	Neg.	Neg.	1.98	1.22
4.00 P.M. By catheter	125	1.027	2.4	Neg.	0.55	1.196

ASCITIC FLUID.

	Volume, c.c.	Sugar, per cent.		Urea, mgm. per 100 c.c.	Chlorides, per cent.
11.20 A.M.	2325	0.203	...	21.9	1.382
3.30 P.M.	3960	1.940	...	19.5	1.354

It is seen that there was hyperglycemia to start with, but yet large quantities of sugar could be utilized. The trivial sugar excretion was partly due to the marked renal impermeability. The glucose dosage seemed to be slightly beneficial and probably prolonged life a little, but this stimulating action was less than is often seen in weakened conditions and there was no indication of any specific effect upon the underlying condition. The experience with this patient confirmed an observation which has been made several times on animals—namely, that if there is no lack of water a blood sugar of 1 per cent. or more is borne at least temporarily with no evident injury.

The lipoid analyses by Miss Wishart show normal cholesterol in contrast to the high values sometimes reported in liver disease. The total fat was remarkably high in both whole blood and plasma, though the plasma was not noticeably turbid. Such a masked lipemia has been mentioned occasionally in the literature in diabetes and other conditions, but the cause or meaning is unknown.

These observations were merely incidental. The actual reason for transferring the patient to the diabetic service was to determine whether acidosis or any other chemical cause of death could be found, and if so to direct treatment accordingly. The question is of some

theoretical interest, and the failure may be discussed under two headings as follows:

1. Acidosis. The point which attracted chief notice was the resemblance of the condition to diabetic coma. Except for the absence of acetone odor, and perhaps the yellowish tint of the skin, an experienced observer might have thought that this patient, with his emaciation and air-hunger breathing, was actually in diabetic coma. The most diverse diseases, such as diabetes, nephritis, cancer, etc., frequently end in coma, of which the exact cause is unknown. In diabetes the acetone bodies have been seized upon as the explanation, merely because they represent a prominent phenomenon which is accessible to chemical demonstration. The conception of diabetic coma as a simple intoxication by the acetone group of substances is not actually disproved, but the objections to it are such that very few writers accept it. On the other hand there has been widespread adoption of the idea that the cause of death is an acid poisoning, as in animals treated with acid experimentally. Of numerous opposing considerations may be mentioned (1) the varying levels of blood alkalinity at which patients go into coma; (2) the well-known fact that in the acid-poisoned animals referred to there is frequently no period of unconsciousness, and if present it is usually brief and can never extend over several days like diabetic coma; (3) the ability by alkali dosage to keep the blood alkalinity at a high normal level in diabetics who die in deep coma nevertheless. It must therefore be concluded either that the theory of acid poisoning is disproved or else that a fatal degree of acidosis can exist without being revealed by any of the available tests, so that we are again thrown back upon the unknown. Also the assumption has been made that hyperpnea is solely the result of acidosis, without regard for the simple clinical observation that the hyperpnea of diabetic coma, though usually diminished, is commonly not abolished by artificially raising the blood alkalinity to normal.

It was therefore of interest to observe a patient with coma and marked hyperpnea without acetone or any evidence of true acidosis so far as the investigation extended. With regard to all tests of acid-base equilibrium yet devised, attention should be given to factors which the authors of such tests have nearly aways overlooked, such as the strong likelihood that toxic states may change the excitability of the respiratory center. If the activity of this center is augmented by substances or agencies other than acids, the work of Yandell Henderson shows how the distribution of bases between blood and tissues may be radically changed. Also, beyond this, there is the possibility of a specific alteration in this distribution from unknown causes to which the peculiar retention of sodium chloride in some conditions offers an easy analogy. It seemed more probable to assume in this case that the hyperpnea was primary like the coma and that the lowering of plasma bicarbo-

nate was secondary and not a sign of acidosis. Therefore no alkali treatment was used, because unpublished animal experiments have shown it to be harmful or fatal under such circumstances.

2. Cause of Death. Chemical causes of death reduce themselves essentially to two, either the presence of harmful substances or the lack of necessary substances. The death in this case was not due to accumulation of acetone, bile or the substances (urea and chlorides) indicative of renal failure. Glucose was given partly as a food and partly as a means of diminishing protein and fat metabolism, and thereby the production of toxic substances that might possibly be formed from them; but there was no real benefit. All chemical investigation of physiology is still so incomplete that poisoning by accumulation of abnormal products cannot be excluded, but the other possibility of lack of vital substances, such as an internal secretion of the liver in this case, is equally open. Since it is necessary to admit an entirely unknown cause for fatal hepatic coma, something similar may perhaps hold for diabetic and other forms of coma. The main purpose in reporting this case was to suggest that the cause of the diabetic intoxication should be treated as a subject of investigation rather than as a matter of speculative assumption.

THE DIAGNOSIS OF LATE SYPHILIS OF THE CENTRAL NERVOUS SYSTEM.[1]

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Despite the fact that certain investigators have obtained contradictory reports on different specimens from the same collection of blood serum sent to different laboratories for the Wassermann test for syphilis, and despite the fact that under certain conditions other than syphilis a positive Wassermann test occurs in the blood serum, the use of the Wassermann serum reaction for syphilis is becoming more and more of a routine procedure in the practice of medicine. This fact in itself is the most conclusive proof that the serum reaction for the detection of syphilis is of value. In many hospitals it is now the custom to have the Wassermann reaction done on the blood serum as a routine procedure on all patients admitted. Also, more and more of the cases coming to the out-patient departments of hospitals are examined for syphilis by means of this test. The result is that in a great many instances in which syphilis was not suspected the attention of the physician is drawn to this disease

[1] Presented before the Association of American Physicians, at Atlantic City, June 16, 1919.

by the positive findings in the blood serum, and in other cases with suspicious lesions or symptoms the diagnosis is confirmed.

Just what the significance of a positive Wassermann reaction in the blood serum is in each individual case is not always clear. Craig[2] perhaps expresses it as well as it can be with our present knowledge by the statement that a positive Wassermann reaction, if persistent, means the presence of living spirochetes somewhere in the body.

If there are living spirochetes somewhere in an individual it is important, especially in cases of some years' duration, to find out, if possible, where they are: for if the central nervous system is involved, and the original infection with syphilis occurred some years before, the type of treatment to be instituted is different from that which would be used in early syphilitic infection or in old cases of syphilis in which the central nervous system is not involved. For, Swift,[3] Walker and Haller,[4] and others have shown that certain cases of syphilis of the central nervous system respond to intraspinal treatment when other forms of treatment have not been so successful. Also, Swift[5] emphasizes the importance of beginning treatment of syphilis of the central nervous system early if good results are to be obtained.

The question arises, therefore, in cases of syphilis in which the infection is of some years' duration, and in which the presence of the disease was suspected perhaps only by the finding of a positive blood-serum reaction, whether involvement of the central nervous system can be detected without resort to lumbar puncture. Southard and Solomon[6] state that a positive serum reaction should be followed by lumbar puncture. This decision is of considerable importance to the patient, for the procedure of lumbar puncture, although not dangerous, often requires a rest in bed for several days.

This study of cases of syphilis of the central nervous system which have been under observation at the Peter Bent Brigham Hospital was undertaken with the idea of throwing some light on this point if possible.

Since the hospital opened in 1913 considerable attention has been focussed on the treatment and diagnosis of syphilis of the central nervous system. Therefore in a great many cases a lumbar puncture has been performed in which there were no definite signs pointing toward syphilis of the central nervous system. In this way a considerable number of cases of involvement of the central nervous system have been detected which might otherwise have been overlooked.

It was felt, therefore, that a study of this series of cases would probably include some in which at least there were no outspoken

[2] Am. Journ. Med. Sc., 1915, cxlix, 41.
[3] Am. Jour. Syph., 1917, i, 524.
[4] Arch. Int. Med., 1916, xviii, 376.
[5] Am. Journ. Med. Sc., 1916, cli, 490.
[6] Neurosyphilis, William Leonard, publisher, 1917.

signs and symptoms of syphilis of the central nervous system, and possibly some in which there were practically none that would be detected by the ordinary routine history-taking and physical examination as practised in a good general hospital. Should such cases be found some decision could be reached in regard to the necessity of lumbar puncture. On the other hand, if none were found it was appreciated that no conclusions were justified against an early diagnostic lumbar puncture until a much larger series of cases had been investigated.

At this hospital the cell count in the spinal fluid and the Wassermann reaction with 1 c.c. or less of the spinal fluid are the two tests upon which reliance is placed to show the activity of the spirochetes in the central nervous system. The group studied included 231 cases. All of these cases had a positive Wassermann reaction in their spinal fluid when 1 c.c. of the fluid was used and many with a smaller amount. Most of them had an increased cell count in the spinal fluid, but in a few instances the cell count was normal. The history and the physical examination of the cases were studied as they were taken on admission by the house officers. A definite history of infection with syphilis in the past was looked for. In the history of the present illness symptoms pointing toward involvement of the central nervous system were sought. From the physical examination the condition of the eyes in regard to irregularities, inequalities or fixation of the pupil was noted. Record was also made of the absence or exaggeration of the knee-jerks and the presence of a positive Romberg test. Of course, any marked disturbances in muscle power or means of locomotion were noted. Finally a record was made of the result of the blood-serum Wassermann test.

Although the summary of the results of these observations is not the primary object of this study, it seems worth while to simply record them as a matter of general interest. In grouping these cases the diagnosis decided upon for the hospital records was used. Southard and Solomon[7] have emphasized the point that it is often difficult to decide just what type of lesion of the central nervous system is present in an individual case. Therefore, it is felt that although there might be some difference of opinion as to the diagnosis in these cases, all would agree that syphilis was responsible for the lesions.

Of the 231 cases, 121 were diagnosed as tabes dorsalis. Of these 121 cases a definite history of syphilis was obtained in 47; in 11 cases the history was suggestive of syphilis; in 63 cases there was no history of a past infection of syphilis; 112 of these 121 cases gave symptoms in the history of their present illness, which was very suggestive of tabes. The symptoms included, in addition to the usual ones of disturbance of locomotion, lightning pains and urinary

[7] Loc. cit.

difficulties, those which pointed exclusively to the stomach and which under certain circumstances might have been justly attributed simply to gastric disorders. In 107 of these cases the pupils were either irregular in outline, unequal or failed to react to light. In 90 of the cases the knee-jerks were absent, increased or markedly variable in strength on the two sides. The Romberg test was positive in 62 cases. The Wassermann reaction in the blood serum was positive in 75, negative in 40 and not reported in 6 of the cases.

The distribution of these various signs and symptoms, however, was such that there were only 2 of the 121 cases in which it could be said that there were no physical signs or points in the history which would make one think of syphilis of the central nervous system. Of these 2 cases 1, Hospital No. M. 3105, was considered on entrace as a case of probable pulmonary tuberculosis. After his blood-serum Wassermann was found to be positive, and no tubercle bacilli could be found in the sputum, it was decided to lumbar-puncture him to see if any evidence of involvement of the central nervous system could be found. On going back over the history of this case there is mention of a sharp pain in the back near the shoulder-blade off and on for three years and some pain in the legs off and on which did not radiate. Apparently neither pain was described in such a manner as to make the investigator think of the lightning pains of tabes. The other case, Hospital No. M. 1494, was a case of pyloric stenosis, which eventually came to operation for carcinoma of the stomach. The history and physical examination gave no symptoms suggestive of syphilis, and it was only on account of the positive Wassermann in the blood that it was felt worth while to do a lumbar puncture in order to see if by any chance the stomach symptoms might be due to gastric crisis. It is quite certain that had a lumbar puncture not been done on account of the positive blood-serum reaction in this case the diagnosis of tabes would not have been made at this time, for there was enough in the stomach to account for the gastric symptoms.

Of the 119 cases, however, which showed definite signs or symptoms of tabes on examination 2 had been in the hospital before and are particularly instructive. One case, Hospital No. M. 5856, was in the hospital in November, 1913, for the vomiting of blood and gastric symptoms. The roentgen-ray pictures showed stasis in the stomach. The case was operated upon, but no definite tumor was found at that time; but pyloroplasty was done on the ground that there might be some disturbance of the function of the pylorus, due to old scars which were now difficult to see. The Wassermann reaction at that time was positive for syphilis and was ignored because the reflexes were normal and no evidence of syphilis could be found. When this patient entered the hospital again in December, 1916, because of no relief from the gastric symptoms, there were

definite signs of tabes. Because these gastric symptoms did not suggest syphilis, valuable time was lost in the treatment of this patient, which probably would not have been the case had a lumbar puncture been done as a routine procedure after finding a positive serum reaction.

The other case, Hospital No. M. 8029, entered the hospital in November, 1913, with diabetes, and a positive Wassermann test was found in the blood serum on routine examination. No attention was paid to it, however, because of the absence of any physical signs or anything in the present illness suggestive of syphilis. When the patient entered the hospital again in February, 1918, in order to have treatment for the diabetes, there was definite evidence of tabes in the physical signs.

In this group of 121 tabetics there were, therefore, 2 cases, or 1.66 per cent., in which syphilis of the central nervous system had been overlooked because of failure to heed a positive blood-serum reaction, and in 2 others an involvement of the nervous system would have been overlooked if reliance had been placed just on the signs and symptoms.

Of the 231 cases 9 were diagnosed as syphilis of the cerebrospinal meninges. Of these 4 cases gave a definite history of syphilitic infection. In all 9 the present illness pointed definitely to an involvement of the meninges of some form or another, so that a lumbar puncture in each of these cases was indicated. In 7 of the 9 cases the pupils showed irregularity, were unequal or did not react properly. Five had some abnormality of the knee-jerks and 1 showed a positive Romberg. Eight of these cases gave a positive blood-serum Wassermann reaction and 1 a negative. The physical signs in these 9 cases were so distributed that attention would have been called to the central nervous system in 7 of them. In the 2 that did not have physical signs to arouse suspicion of the meninges the history of the present illness was so definite that they would not have been overlooked.

Forty-five cases in this group of 231 cases of syphilis of the central nervous system were diagnosed as general paresis. Of these only 10 gave a past history of syphilis. In 38 the history of the present illness pointed quite definitely to some involvement of the central nervous system. In 35 the pupils showed either irregularity, inequality or disturbance of reaction. In 30 the knee-jerks were either hyperactive, markedly unequal or absent, and in 15 the Romberg was positive; 37 gave a positive blood-serum reaction, 7 were negative and in 1 case there was no report.

The distribution of these various physical signs in the 45 cases was such that in only 4 were there none of them. Of these 4, 3 showed definite points in the history of the present illness that would direct attention to the central nervous system. This makes 1 case of the 45, or 2.2 per cent., in which involvement of the central nervous

system would not have been suspected from the history or physical examination.

This case, Hospital No. M. 2775, came in for supposed kidney trouble with albumin in the urine and some acute febrile infection. After examination it was thought that the albumin was simply part of the febrile attack. The fever gradually subsided and during convalescence the patient suddenly became quite irrational and excited. These attacks continued and the patient was transferred to the psychopathic hospital after a lumbar puncture had shown there was definite syphilitic involvement of the central nervous system. This patient's physical examination and history had not in any way directed either the house officers' or the visiting staff's attention to syphilis up to the time of the mental upset.

One of the cases in which the diagnosis was clear upon entrance to the hospital is of interest in regard to the possibility of an earlier diagnosis had a lumbar puncture been done before treatment had started. This case, Hospital No. M. 5541, had been treated in one of the outdoor departments of a hospital of this city for ten months as a result of finding congenital syphilis in one of her children and a positive Wassermann in her blood. Nine weeks before entrance she had been treated by her family physician for severe headaches, with a change in her glasses, and it was only after this persisted and she told her doctor about the positive Wassermann test in the blood that he sent her to the hospital for lumbar puncture. In this case physical signs were either absent or had been overlooked both at the hospital and by her own physician.

Another case might have been overlooked but for the custom of doing a puncture on suspicious cases. This man, Hospital No. M. 2362, gave a history of an attack of unconsciousness from which he had recovered on entering the hospital. It was found there were some arteriosclerosis and increased blood-pressure, and as the physical examination at that time was essentially negative, it was assumed that the attack had been due to a temporary disturbance in circulation in the brain. It was only when the blood Wassermann was reported positive that a lumbar puncture was suggested.

Fifty-six of the 231 cases were diagnosed as cerebrospinal syphilis. Of these, 28 gave a definite history of infection of syphilis in the past; 51 presented symptoms in the history of the present illness which were suggestive of involvement of the central nervous system; 35 showed inequality, irregularity or some disturbance in reaction of the pupils; in 28 there was some disturbance in the knee-jerks and in 10 the Romberg was positive; 38 of the cases showed a positive serum reaction in the blood, 15 a negative and in 5 the report was missing.

These various abnormalities on physical examination were spread over 48 of the 56 cases, so that in only 8 cases the attention would not have been called to the central nervous system as a result

of the physical examination alone. Of these 8 cases 3 gave definite histories which pointed toward involvement of the central nervous system. In 2 of the remaining 5 cases lumbar puncture was done on very slight evidence. In 1 case, Hospital No. M. 2465, the physical examination and blood Wassermann were negative, and the lumbar puncture was recommended by careful house officers in the out-patient department to see if syphilis might be the cause of the headaches. The other case, Hospital No. M. 6684, had some slight disturbance of memory and a positive serum reaction in the blood.

This leaves 3 cases in this group, or 5.2 per cent., in which syphilis of the central nervous system would have been overlooked except for routine lumbar puncture. In one, Hospital No. M. 6337, there was nothing in the history or physical examination to suggest syphilis of the central nervous system. As the patient had a gumma of the leg she was sent into the hospital for a lumbar puncture as a matter of routine by the house officer to clear up the question of involvement of the central nervous system. It was found that involvement existed.

Another case, Hospital No. M. 6686, had apparently suffered from some disturbance for fourteen years and had been to a good many hospitals. The summary of the physical findings and history made by the house officer at this hospital says that the case sounds like either primary anemia, neurosis or tertiary syphilis. There was nothing in the physical examination or history to make a definite diagnosis, and lumbar puncture was done to clear up the case because all else had failed, and the blood serum was found positive.

The third case, Hospital No. M. 1984, an active business man, came under observation because of a request by an orthopedic surgeon for a general medical overhauling in order to see if a cause could be found for an arthritis in the hip. A history of syphilis, some twelve years before, was given, and although it was felt that the hip arthritis was not due to syphilis a Wassermann reaction was taken in order to see if the treatment for the syphilis in the past had been successful. The Wassermann reaction was found positive, and simply in order to clear up the possibility of involvement of the central nervous system a lumbar puncture was done. The cell count in the spinal fluid was increased and a positive Wassermann reaction was found. This patient showed no signs or symptoms suggestive of involvement of the central nervous system.

From this brief summary of the cases of syphilis of the central nervous system that have been observed at the Peter Bent Brigham Hospital it is apparent that in a very high percentage of the cases there are strongly suggestive symptoms in the history or positive signs on the physical examination. It must be borne in mind, however, that many of these cases might have shown an increased cell count and a positive Wassermann test in their spinal fluid long before

any symptoms on the part of the central nervous system appeared. These cases, therefore, help us little, if any, in trying to decide if involvement of the central nervous system in old syphilis occurs without physical or other signs. On the other hand, in all the groups of cases except that of syphilitic meningitis there was a small percentage of cases in which there were no signs or symptoms to call one's attention to the central nervous system. These cases, therefore would have been missed in the routine examination of patients at this hospital but for a custom of investigating the central nervous system in many of the old cases of syphilis discovered on examination or by a routine blood-Wassermann test. Even more striking in regard to the need of investigating the spinal fluid in cases with positive Wassermann, in which the infection was some years previous, are the two cases in which a positive Wassermann in the blood had been ignored because of lack of symptoms or signs and in which subsequently evidence of advanced tabes was found.

This small group of cases shows definitely that it is possible to overlook involvement of the central nervous system with syphilis in an ordinary careful history-taking and physical examination as completed in the wards of a general hospital even when syphilis is known to exist. This possibility of error must become magnified in busy out-patient clinics. The study of the spinal fluid will readily give evidence of syphilis of the central nervous system when symptoms and physical signs are not obtained on careful routine examination.

Therefore, as the procedure of lumbar puncture, although somewhat time-consuming to the patient, is practically without danger; and as it opens up a means of diagnosing late syphilis of the central nervous system when other diagnostic means fail, and as late syphilis of the central nervous system calls for special form of treatment, it seems fair to demand that in all cases of old syphilis a lumbar puncture should be performed as a diagnostic procedure before instituting treatment.

THE MURMURS OF MITRAL STENOSIS AND OF AORTIC REGURGITATION.

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Owing to the difficulty of hearing the very earliest murmurs of aortic regurgitation and of mitral stenosis, this work was begun in the hope of finding some specially advantageous method of examination which would make these murmurs more readily audible or

more characteristic. Especially advantageous methods have been found, and, moreover, most interesting facts have been observed in regard to the minimal murmur which may be considered as due to a mitral narrowing.

Thirty-six patients with valvular disease were studied for this purpose, the work being done at the Military Heart Hospital at Colchester, England, where they had been sent for diagnosis and for discharge from the British Army. They were all up and about and performing moderate physical exercise, in spite of which none complained of any symptoms of failing circulation to indicate that they should be relieved from the exercise routine of the hospital. They were all cases without signs of cardiac insufficiency, not necessarily cases which had recently acquired the valvular disease or in whom the lesion was not well advanced, but having a heart so little diseased as a whole that it was able to carry on its function in a practically normal manner even when the patient engaged in the activity afforded by the exercise classes. There were many cases of combined aortic and mitral disease in the series, 19 having aortic regurgitation and 2 of these aortic stenosis also, while 22 cases were considered to have mitral stenosis. There were 10 other cases which showed atypical murmurs of mitral stenosis and which lacked sufficient other evidence to make the diagnosis certain.

The cases were examined under eight different conditions, to determine which if any were the most favorable for bringing out the characteristic murmurs: (1) standing upright; (2) standing upright with the chest held in forced expiration; (3) standing with the trunk bent forward at an angle of 45 degrees to the horizontal; (4) lying on the back; (5) lying on the back with the chest held in forced expiration; (6) lying on the left shoulder and side, the trunk turned so as to be about 45 degrees from the horizontal; (7) after exercise, hopping on both feet, rising three or four inches from the floor about thirty times in succession, the patient was listened to standing upright; (8) lying on the left side as in (6). Each case was auscultated both with the stethoscope and with the direct ear against the patient's chest.

Mitral Stenosis. It is of course necessary to define the murmurs which have been considered diagnostic of each of the valve lesions in order that we may consider their variations. For mitral stenosis there has been demanded a prolonged, low-pitched, rumbling sound at the apex of the heart, occupying most of the period between the second heart sound and the first. It need not occupy all of this diastolic period, but it is insisted that it is a prolonged and not a short sound and that it is of a rough rumbling character, not humming. In almost all cases there is a rougher short accentuation of this rumble, occurring just before the first heart sound and having a crescendo character. The crescendo portion of the murmur may or may not be continuous with the longer rumbling portion which

precedes it, but is always continuous with the first sound. It is not, as has been implied, found in all cases, being absent in two of the cases of this series and also in all cases of auricular fibrillation with a heart-rate below 68 per minute. No cases of auricular fibrillation are included in this series because of the great influence of heart-rate upon the quality of the murmur. It must be emphasized that these murmurs of mitral stenosis, especially the crescendo murmur, are often very narrowly localized at a point at or very near to the actual apex thrust and cannot be heard even 1 or 2 cm. from this localized area.

There are certain other signs of this valve lesion to which we turn for confirmation of our suspicions when the murmur is atypical. We consider these four of importance in the order named: (1) Evidence of mitral regurgitation, *i. e.*, a distinct blowing or harsh systolic murmur, present when the heart shows no signs of failure, heard at the apex and transmitted to the left and to the right of this point. It must be heard under all conditions of examination and must be associated with enlargement of the heart to the left to beyond the midclavicular line. The presence of mitral regurgitation indicates disease of the mitral valve, and since disease has attacked this valve there is an increased likelihood of a stenosis being present also; (2) a sharp slapping apex impulse; (3) a sharp snapping first sound at the apex; (4) evidence of rheumatic disease of the aortic valve. This increases the likelihood of there being other foci of disease in the heart, and it is quite common for both of the valves to be affected. A word of caution is necessary in regard to the sharp first sound and the slapping apex impulse, for it must be remembered that these are accessory signs and not diagnostic signs. A diagnosis should not rest on them alone no matter how pronounced they may be.

The presence of a diastolic or presystolic thrill at the apex has been omitted as an accessory sign of this lesion, because it is so very difficult and deceptive to recognize, and because, though plain enough in most typical cases of mitral stenosis, it is believed that the thrill is never found to be plainly felt in cases with such slight murmurs that the diagnosis is questionable. It is always better in the interest of the patient to make a negative diagnosis than to bolster up a questionable murmur with a questionable thrill and condemn him to unnecessary restrictions. Patients with the effort syndrome (irritable heart) commonly show a sharp apex impulse and sharp first sound with a simulated presystolic thrill. Such a combination of signs should, of course, make us very suspicious of the presence of mitral stenosis, but a diagnosis without the hearing of a characteristic murmur is certainly quite unjustified.

The presence of an accentuated second sound at the pulmonary area has been omitted as an accessory sign for a quite analogous reason. Undoubtedly it is present in many cases of mitral stenosis,

but it also occurs in very many individuals who have no evidence whatsoever of cardiac disease, in whom, in fact, no other abnormality can be found. Three per cent. of 17,200 recruits examined at Camp Grant, Ill., showed this accentuation. It is considered therefore to be a quite unreliable prop for a doubtful diagnosis.

Enlargement of the heart to the right of the sternum has been omitted as an accessory sign of this lesion because of the fact that this finding is not believed to indicate hypertrophy of the right ventricle, as it has been so often stated to do. The right border of dulness is not due to the right ventricle but to the right auricle. This may be displaced to the right if the heart mass enlarges or may be acutely or chronically enlarged itself. Only the last of these is especially liable to be due to mitral stenosis, and then only when the stenosis is of such a grade as to be readily recognizable otherwise.

Considering our 22 cases of mitral stenosis:

2 had only mitral stenosis.

6 had mitral stenosis and regurgitation.

10 had mitral stenosis and regurgitation with aortic regurgitation.

3 had mitral stenosis with aortic regurgitation.

1 had mitral stenosis with probable aortic regurgitation.

Comparing the murmur heard in the normal erect position with that heard under the other conditions of examination, in regard to whether the other conditions rendered it more or less loud or typical, the results may be tabulated as follows:

	More.	Same.	Less.
When erect with forced expiration	7	6	8
When standing with trunk bent forward	13	8	1
In dorsal prone position	10	4	8
In dorsal prone position with forced expiration	7	6	7
When lying turned on left side	18	0	4
After exercise, when erect	21	0	1
After exercise, when turned on left side	21	0	1

It is plain that the erect position and the dorsal prone position are of about equal value, though the murmur is louder in one position than in another in about four-fifth of the cases. Furthermore, the erect and dorsal positions in forced expiration are of no different value from the normal erect position. In the great majority of cases the left lateral position makes the murmur more typical or louder, as does the bent forward position to a somewhat lesser extent. In every case but one the murmur is better heard after exercise than before, and in every case but one the optimum condition was the left lateral prone position after exercise.

This one case is quite exceptional throughout in regard to the effect of exercise on the audibility of the murmur, though it was an undoubted instance of mitral stenosis. It was the only one in the series in which the bent forward position and both positions after

exercise were less favorable than the normal erect position, and was one of the four cases in which the left lateral position was less favorable than the erect. The best position for this case was the dorsal position with forced expiration.

The facts in regard to the crescendo murmur are expressed by the following table:

Patient.	Murmur heard.
In erect position	In 4 cases.
In one or more of other positions	In 9 cases plainly. In 7 cases poorly defined.
After exercise, lying on left side	In 13 cases.
After exercise, erect	In 7 cases.
Before exercise, lying on left side	In 4 cases.
In dorsal prone position	In 4 cases.
In dorsal prone position with forced expiration	In 1 case.

There were two cases in which the crescendo was not heard in any position.

It must be remembered that after exercise the crescendo is often only present for the first few beats, so that if there is doubt about an observation the exercise should be repeated or perhaps increased in severity and the patient should lie upon the left side promptly.

The main diastolic sound which was heard under the conditions which elicited the crescendo was, with two exceptions, recorded as a "long rumble." In one exception it was recorded as a "murmur" and in the other, a case in which the crescendo was poorly defined, it was recorded as "a long low hum." Both of the two cases which did not develop a crescendo murmur in any position showed a prolonged loud rumble in the favorable positions, and in the erect positions showed a "rumble" and a "hum" respectively.

Eighteen cases did not show a crescendo murmur in the normal erect position. Two of these did not develop one in any position. In 12 of the remainder, when erect, the diastole showed either a long, low-pitched, more or less rough rumble or a low-pitched hum. Two showed nothing at all in the erect position to suggest mitral stenosis, and the only abnormality shown by the other two was a prolongation of the first sound in one and a short diastolic sound recorded as a third heart sound in the other. Nevertheless, in all of these cases a more or less well-defined crescendo, together with a diastolic rumble was produced in at least one of the other positions. The value of using the other positions is quite evident.

From these observations on the variations of the murmur it appears as if the mitral narrowing which in typical cases produces the long diastolic rumble with or without the crescendo accentuation before the first heart sound, produces under other circumstances either no abnormal sound, a prolongation of the first heart sound, a short diastolic sound of the quality of the third heart sound or a

more or less faint, low-pitched, humming, diastolic sound. Individual cases will often show a sort of progression in this series as we listen with the patient in increasingly favorable positions. For example, Case 41 showed a "loud diastolic hum" in the normal position which was "louder" in forced expiration; in the bent forward position it was recorded as "a long low-pitched rumble;" in the dorsal position as "a short low-pitched murmur starting at the time of the third heart sound;" with forced expiration it was "unchanged;" in the left lateral position it was "a long low-pitched rumble;" after exercise when erect "rumble is louder;" when on the left side after exercise a "plain diastolic rumble was heard" and for the first few beats "a short crescendo." These sounds may perhaps be considered as lesser manifestations of the stenosis murmur, appearing either with lessened blood flow through the valve orifice or under conditions unfavorable to the transmission to the chest wall of the vibrations producing the sound. Their presence should always make us suspect a lesion and shoud call for further careful search for the characteristic signs.

What then shall be said of the cases in which even in the favorable positions we hear only one or more of these lesser manifestations of the murmur? There are 10 such in this series, 5 of which showed no other abnormal physical signs, 3 had mitral regurgitation and 2 had aortic regurgitation. In this group of 10 the same four positions appeared most favorable, as appeared so in the group considered to surely have the lesion, the murmur being either louder or more typical of mitral stenosis in these positions. The dorsal positions, however, instead of being neutral were distinctly less favorable.

Although it seems quite reasonable to me, in view of the facts of this investigation, to view these sounds as an evidence of an early stage of the lesion, I do not think we are ready yet to base a diagnosis upon them when they occur alone. Cases showing only these signs should be followed for a long enough time to be sure that they do develop the typical signs of the disease, or autopsy should show a mitral narrowing when only such signs are present, before we shall be able to accept them as diagnostic. Attention is called to the occurrence of these atypical sounds in the hope that many such observations may be made.

There has been no additional light from this investigation upon the always difficult problem of separating the diastolic murmurs heard at the apex in the presence of aortic regurgitation into a group due to mitral stenosis and a group due not to mitral stenosis, but to the Flint mechanism. It must be emphasized that the blowing, fine quality of the murmur of aortic regurgitation, is not heard either in the Flint murmur or in the mitral stenosis, and, moreover, the pitch of the aortic regurgitation murmur, is always a higher one than is ever reached by the other two. Of the 16 cases which have both aortic regurgitation and the apical rumble all but

4 were considered to have mitral stenosis because of the presence of accessory signs of this lesion; 2 of these 4 were indeterminate cases and 2 were considered to be instances of the Flint murmur. These 4 cases showed the same type of variations in the apical murmur, with posture and exercise, as did the cases of mitral stenosis.

Aortic Regurgitation. For the diagnosis of aortic regurgitation we have demanded a more or less prolonged, blowing murmur much like the swish of a rocket heard very faintly, but tending to diminish rather than to increase in intensity. It may rarely have a musical quality like a fife. This murmur begins immediately after the second heart sound, and nearly always lasts through until the first sound, though it may fall somewhat short of it. It may be very faint, and since it is not well transmitted by the bell of the ordinary stethoscope, it will be often missed if this is the only means of auscultation used. The direct stethoscope and the diaphragm type of stethoscope, such as the Bowles, transmit this murmur better than the ordinary instrument, but neither of them better than the ear laid directly upon the chest.

The area of maximum audibility of this murmur may be a very large one at the base or may be very restricted. It may be in the second, third, fourth or fifth intercostal spaces on either side of the sternum or over the sternum itself. In this series of 19 cases the *area of maximum audibility* in the erect position was:

Fourth left interspace	11 times.
Third left interspace	8 times.
Second right interspace	6 times.
Fifth left interspace	1 time.
Sternum at level fifth interspace	1 time.

There were 3 cases in which the murmur was heard in the erect position only with the direct ear and not with the ordinary stethoscope. Of these 3 cases the murmur was heard in 1 only in the second right interspace, in another only in the third and fourth left interspaces and in the third in all three of these places.

As to accessory signs of this lesion which will be helpful when the murmur is difficult to hear, it must be said quite emphatically that there are none reliable. The Corrigan or water-hammer pulse, increased pulse-pressure as measured by the sphygmomanometer, capillary pulsation, a heaving apex impulse, these things are found in cases with plainly developed murmurs, but I recall no instance in which they were present when the murmur was so faint or so atypical that there was any doubt as to the lesion. Certainly they alone without a murmur should not be made the basis of a diagnosis, and it must be remembered that any of them may occur from other causes than this valve lesion.

Comparing the murmur heard in the erect position in these 19 aortic cases with that heard under the other conditions of examina-

tion, in regard to whether the other conditions rendered it more or less loud, it was found:

	Louder.	Same.	Less.
When erect with forced expiration	16	3	0
With trunk bent forward	18	1	0
In dorsal prone position	2	4	11
In dorsal prone with forced expiration	7	3	8
When lying turned toward left side	2	7	9
After exercise in erect position	14	2	0
After exercise: when turned on left side	5	1	5

In this lesion we are concerned only with loudness of the sound—ease of hearing—it is not as with mitral stenosis a question of the quality or character of the sound for this scarcely changes. Here the favorable positions are quite apparently the bent forward position, the erect position with forced expiration and the erect position after exercise. It seems likely that the bent forward position after exercise would be still better, but unfortunately this was not investigated. The dorsal position and the left lateral positions are evidently unfavorable.

The series included cases with all grades and intensity of the murmur, from the faintest which could be heard, to a very loud, harsh blow heard all over the body of the heart and at the apex. A relation was noted between the loudness of the murmur and the area at which it was heard, the fainter murmurs not being heard in the third, fourth or fifth right interspaces or in the second or fifth left interspaces. As the faint murmurs were made louder by position or by exercise the area of audibility is increased in a more or less radial direction from the original area.

It may be noted in passing that 6 of the cases had a harsh systolic murmur at the aortic area, and in 2 of these 6 a systolic thrill was felt both there and in the vessels of the neck. These 2 cases, having also a small arterial pulse wave with a blunt peak, were considered to have *aortic stenosis*. In both of these the thrill was much plainer after exercise and in the bent forward position. One of the cases of aortic stenosis showed an accentuation of the second sound at the aortic area as did four other of our cases of aortic regurgitation. This is mentioned only in order to emphasize the fact that to find an accentuation of the second sound at the aortic area must not be considered as evidence against the presence of aortic regurgitation.

SUMMARY. The best conditions for hearing the murmur of mitral stenosis are present after exercise and especially when lying on the left side after exercise. Without exercise the left lateral and the bent forward positions are by far the most favorable. The dorsal position is better than the erect in about 45 per cent. of the cases, though in 36 per cent. it is less favorable. All of these positions should be used in listening to doubtful cases, and especially the

positions after exercise, without which a negative diagnosis should not be made.

The crescendo murmur is not present in all cases of mitral stenosis, but is best elicited by the left lateral position after exercise. It may be present for the first few beats only, even under these conditions. A case which develops a crescendo murmur may show either a long rough diastolic rumble or a low-pitched hum in the positions in which the crescendo is absent. Either of these may be loud or faint but as a rumble becomes faint it tends to change its character and to become a hum, while a hum when it becomes louder changes to a rumble. There may be even less abnormal sound during diastole than these; perhaps only a short sound like the third heart sound, or perhaps no diastolic sound at all. The first heart sound may or may not be prolonged. In fact in any one position, and especially in the erect position, some cases may show nothing at all to suggest mitral stenosis, yet in the more favorable positions a typical combination of murmurs may develop. This observation is very important in its bearing on the diagnosis of early cases.

These variations of the murmur with position should also be carefully borne in mind in following the progress of individual cases over a period of months or years. Each examination should be made under the same conditions or the quality of a murmur cannot be compared from time to time, nor can any importance be placed upon the appearance of a murmur for the first time when one of the more favorable position is first used. It is suggested that these diastolic sounds may be the earliest evidence of mitral stenosis, and that they may progress with a progression of the lesion in the order named in the text, and in a way similar to that in which their character progresses as more favorable positions are used.

The best conditions observed for hearing the murmur of aortic regurgitation were the erect bent forward position, the erect position in forced expiration and the erect position after exercise. It seems probable that the bent forward position after exercise would be better still than any of these. This murmur varies only in intensity and not in quality. At times it is not heard with the ordinary stethoscope but can be heard with the ear directly against the chest wall. A negative diagnosis should never be made unless direct auscultation is used. Very faint murmurs due to aortic regurgitation were heard near the sternum in the fourth left interspace, the third left interspace or the second right interspace, and these three areas in the order named were the most common areas of maximum audibility of the plainer murmurs.

As a whole, then, these special procedures for examination have proved to be decidedly valuable in the recognition of early or obscure cases of valvular disease. There is a certain variability from case to case as to which position will give the optimum result, but, in general, exercise and the left lateral position are most favorable for

mitral stenosis and the bent forward position for aortic regurgitation, while direct auscultation is indispensable for the fainter murmurs of the latter lesion. The use of the different positions is very instructive to the examiner, giving him an idea which cannot be obtained otherwise of the degree of disturbance of the blood currents in the heart. This is particularly the case with mitral stenosis, and certain minor abnormal diastolic sounds are pointed out which are believed to presage the more typical murmurs of this lesion.

A COMPARISON OF MEDICAL CASUALTIES IN BRITISH AND AMERICAN TROOPS AT A GENERAL HOSPITAL IN FRANCE.

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On November 1, 1917, United States Army Base Hospital No. 5 began to act as a British General Hospital in Boulogne, and at first dealt exclusively with British soldiers. After January 1, 1918, certain newly landed American divisions were brigaded with the British in Flanders and Northern France, from which general area all the patients were drawn, and therefore numbers of their sick were also sent to this hospital. These Americans in the field, though not actually in the trenches as much as the British, were given British rations, lived under British sanitary conditions and worked according to the same general plan as did the British. Thus a chance arose of comparing in the same hospital and at the same time the diseases which were most prevalent among two widely different groups of soldiers who were living together in the same way, the British representing older men, well accustomed to the climate, food and surroundings, the Americans being younger and entirely unused to their environment.

The following paper reports a statistical comparison of the common diseases occurring in 3643 of the British and 1696 of the American medical cases seen in United States Army Base Hospital No. 5 from January 1 to December 1 of the year 1918. These figures included all the American sick who were admitted during this time. About twice as many successive British admissions were considered each month, as their number were much greater. In this way seasonal variation of diseases or epidemics in both armies

were included and a fair comparison was obtained of the most prevalent types of disease among the two groups of men as a whole. The tabulated diagnosis was made in each case after necessary observation and study.

Twelve well-defined and frequent types of disease were met with: (1) Fever of undetermined cause, largely of the trench-fever type; (2) infections of the upper and lower respiratory tract; (3) diseases of the ear; (4) pulmonary tuberculosis and pleurisy, with or without effusion; (5) gastro-intestinal disease, including typhoid fever and dysentery; (6) venereal disease; (7) scabies; (8) nephritis; (9) casualties due to fatigue and exposure, such as are labelled myalgia, debility or neurasthenia; (10) diseases of the heart, including valvular disease and "D. A. H.;" (11) arthritis, with definite pathological changes in one or more joints; (12) cerebrospinal meningitis. In addition there were isolated cases of cancer, mumps, scarlet fever, diphtheria, herpes zoster, tape-worm and other diseases of one sort or another, which were so rare as to be negligible. A summary of the important features of this study is given in Table I:

TABLE I.

Disease.	British.		American.	
	Actual number.	Number per 1000 casualties.	Actual number.	Number per 1000 casualties.
Infections of the upper and lower respiratory tract	1269	345	783	461
Fever, cause undetermined, largely trench fever	1102	310	153	90
Fatigue	361	97	136	81
Gastro-intestinal disease, including typhoid fever and dysentery.[1]	344	94	329	194
Nephritis	212	57	8	5
Heart disease, including valvular disease of the heart and "D. A. H."	161	44	43	25
Pulmonary tuberculosis and pleurisy	97	27	77	45
Diseases of the ear	45	12	37	22
Arthritis	22	6	80	48
Scabies	15	4	18	11
Venereal disease	12	3	28	16
Cerebrospinal meningitis	3	1	4	2
Total	3643	1000	1696	1000

One of the most striking points of this comparison was the prevalence of trench fever and nephritis among the British and the uncommonness of these diseases among the Americans.

[1] As will be pointed out, the apparent relative infrequency of typhoid, dysentery, scabies and venereal diseases among the British admissions was in large measure due to the fact that these cases were sent direct to isolation hospitals as soon as the diagnosis was made and did not pass through general hospitals.

TABLE II.

Disease.	British.		American.	
	Actual number.	Number per 1000 casualties.	Actual number.	Number per 1000 casualties.
Fever, cause undetermined, largely trench fever	1102	310	153	90
Nephritis	212	57	8	5

As can be seen, about 31 per cent. of the British medical casualties were due to trench fever and 6 per cent. to nephritis, while only 9 per cent. of the American casualties were due to trench fever and 0.5 per cent. to nephritis. It has been shown that the virus of trench fever is transmitted by lice, and it has been suggested that the cause of trench nephritis, as well, is a lice-borne infection. The Americans were as much exposed to lice as the British, and as much bitten. Their apparent immunity to both diseases as contrasted with the British susceptibility is remarkable. The underlying reason, probably, is because the Americans were billeted in areas where infected lice were found in small numbers and where the number of trench fever "carriers" was so small as to prevent any general infection of the lice. Thus the vicious circle was interrupted. Had the Americans stayed long enough in infected areas to develop the disease, and in turn to infect large numbers of lice, it is probable that they would have developed both trench fever and nephritis to a greater extent.

Infections of the lower respiratory tract caused a large number of the sick from both groups of men.

TABLE III.

Disease.	British.		American.	
	Actual number.	Number per 1000 casualties.	Actual number.	Number per 1000 casualties.
Influenza	724	196	448	265
Acute and chronic bronchitis	270	74	157	92
Bronchopneumonia	40	11	26	15
Lobar pneumonia	62	17	51	30
Total	1096	298	682	402

Table III suggests that respiratory infections were a commoner source of medical casualties among the Americans than among the British. If the figures are analyzed in greater detail the following points are brought out:

TABLE IV.

Disease.	British.		American.	
	Actual number.	Number per 1000 cases of respiratory infection.	Actual number.	Number per 1000 cases of respiratory infection.
Influenza	724	660	448	656
Acute and chronic bronchitis	270	246	157	230
Bronchopneumonia	40	36	26	38
Lobar pneumonia	62	58	51	76

Influenza was common among both the British and Americans and caused an equal percentage of the admissions due to respiratory diseases as a whole. Acute or chronic non-influenzal bronchitis was a second large factor in this group of diseases and was slightly greater among the British than among the Americans in part, because chronic bronchitis and emphysema were found in a number of old British soldiers and was rare among the Americans.

Pneumonia of either the broncho or lobar type and following influenza caused all the deaths in this series. Since pneumonia was only seen sporadically and infrequently before the first wave of the 1918 influenza epidemic developed, the cases of influenza, broncho- and lobar pneumonia were considered together.

TABLE V.

Disease.	Actual number.	Number per 1000 cases of influenza; broncho- and lobar pneumonia.	Total deaths.	Deaths per 1000 cases of influenza; broncho- and lobar pneumonia.	Deaths per 100 cases of broncho- and lobar pneumonia.
BRITISH.					
Influenza	724	877			
Bronchopneumonia	40	48			
Lobar pneumonia	62	75	23	28	22
AMERICAN.					
Influenza	448	853			
Bronchopneumonia	26	50			
Lobar pneumonia	51	97	31	59	40

This table shows that bronchopneumonia followed influenza in about 5 per cent. of both British and American cases, while lobar pneumonia occurred in about 7 per cent. of the British and in 10 per cent. of the American cases.

The total mortality of the British due to influenza averaged nearly 3 per cent. while that of the Americans averaged 6 per cent. The British mortality of the postinfluenzal pneumonia cases alone was 22 per cent. against an American mortality of 40 per cent. Thus it seemed that the Americans developed more pneumonia as a com-

plication of influenza than did the British and suffered twice as high a death-rate.

Gastro-intestinal and venereal diseases and scabies may be considered as theoretically preventable diseases; they were seen much oftener among the Americans than among the British.

TABLE VI.

Disease.	British.		American.	
	Actual number.	Number per 1000 casualties.	Actual number.	Number per 1000 casualties.
Diarrhea	177	48	139	83
Gastritis	91	25	64	38
Appendicitis	50	14	76	45
Dysentery	11	3	33	19
Jaundice (catarrhal)	14	4	11	6
Typhoid group	1	..	6	3
Venereal	12	3	28	16
Scabies	15	4	18	11
Total	371	101	375	221

There are various reasons for the apparent difference shown in Table VI. The British soldiers were used to their rations, whereas the Americans found the food different from that to which they were accustomed, and disliked it. As a result they ate food and drank water which was outside that issued, and which probably caused such forms of indigestion as diarrhea, gastritis or catarrhal jaundice. Many men were admitted from both armies with histories suggesting mild appendicitis, but who were well at entry. The diagnosis of this disease, however, was made more frequently among the Americans than among the British, because, apparently, American physicians are less conservative in regard to this diagnosis than are the British. Finally, the results of the table are misleading because, according to British regulations, cases of dysentery, typhoid, venereal diseases and scabies were discovered as early as possible and were sent at once to special hospitals. It is probable that the newly arrived American medical officers in advanced areas did not know the proper channels through which the men should have been discharged, thus sending cases to a general hospital from field or evacuation hospitals which should have gone elsewhere.

An interesting impression given by the Americans was that any inherent tendency to disease which any one of them might have was stimulated by such a sudden and complete change of method of life as the one to which they were exposed. This is illustrated by comparing the occurrence of pulmonary tuberculosis with positive sputum and of infectious arthritis in the two groups.

TABLE VII.

Disease.	British.		American.	
	Actual number.	Number per 1000 casualties.	Actual number.	Number per 1000 casualties.
Pulmonary tuberculosis with positive sputum	22	6	27	16
Infectious arthritis	22	6	80	48

According to regulations both sets of men had been examined carefully before joining the army. Yet pulmonary tuberculosis was found nearly three times as frequently among the Americans as among the British. The histories of the men showed that many of them had had pleurisy several years before—that until coming abroad they had felt well in every way—but on arrival in a strange country and surroundings had suffered an acute flare-up of their latent disease.

The difference in occurrence of true arthritis with involvement of one or more joints was even more striking. It was rarely seen among the British but was common among the Americans. In many cases the arthritis was a recurrence of acute articular rheumatism which had been latent for a long time but which the trip abroad seemed to awaken.

The remaining common illnesses are grouped together for easier comparison.

TABLE VIII.

Disease.	British.		American.	
	Actual number.	Number per 1000 casualties.	Actual number.	Number per 1000 casualties.
Myalgia, fatigue, debility and neurosis	361	97	136	81
"D. A. H."	156	43	36	21
Valvular heart disease	5	1	7	4
Ear disease	45	12	37	22
Pleurisy with or without effusion	75	21	50	29

The number of patients who were merely tired out or who had some form of neurosis was greater among the British than the Americans. Closely related to this group was the D. A. H. or "effort syndrome," which was doubly large among the British. The obvious explanation is that the Americans, who were all fresh troops, had not had time to develop such manifestations of fatigue. Valvular disease of the heart, due to faulty physical examination at entry to the army, was discovered oftener among the Americans than among the British, but was rare. Ear disease, usually as acute or chronic suppurative otitis media, was more frequent among the

Americans. This was in part, probably, because of the relatively greater frequency of respiratory infection among them, as during 1918 inflammation of the accessory sinuses and ears was a not uncommon accompaniment of influenza and bronchitis.

Finally, pleurisy was seen about equally often among the two groups. Pleurisy with effusion, however, was unusual among the British as compared with the Americans. This fact can be used as another example of the tendency shown by latent disease in the Americans to flare up upon arriving in France.

There seems no more logical reason than the one offered to account for the fact that the Americans should have been so immune to trench fever and trench nephritis, as they were as much exposed to lice and to cold and wet as were the British. Probably had they remained long enough in areas in which infected individuals and lice were prevalent they would have suffered as much as did the British. The differences in diseases otherwise can be explained, in part, by comparing the military experience and mental reactions of the two groups.

There was a striking difference in the make-up of the patients as considered from the point of view of age and length of military service. In a group of 1000 British soldiers from these statistics 619 were less than thirty years old and 381 were over thirty. Of an equal number of Americans 872 were less than thirty years old and only 128 were over thirty. Of the British, 739 had been in the army in England or France for more than two years, while of the Americans only 60 had been in the army for more than two years; 385 of the British had been in France for less than one year and 971 of the Americans had been in the country for less than one year. Thus the British patients were much older, both as men and as soldiers, than the Americans, and more of their constitutionally unfit had been weeded out. They also had the benefit of experience and knew how to care for themselves better than did the Americans.

As great a difference was found by comparing 100 British sergeants with an equal number of American sergeants in the same way. Of the British sergeants 61 were less than thirty years old, none had been in the army for less than two years and 70 had been in France for more than two years. Of the Americans 81 were less than thirty years old, only 31 had been in the army for more than two years and 90 had been in France, less than six months. Thus the responsible British non-commissioned officers were most carefully picked and experienced men, while the Americans, because of insufficient material and the urgency of the situation were not. No figures were available for comparing the experience of individual battalion medical officers, but presumably the Americans were at an equal disadvantage. General sanitary orders and regulations therefore could be enforced far more easily among the British than among the Americans.

Finally, the British and American mental attitude toward their work seemed different. The British patients gave the impression of being, on the whole, self-contained, sober-minded men. The Americans in contrast were irresponsible boys to whom the adventure of coming to the war appealed strongly, and as a result they were casual in regard to their own care of themselves, taking every liberty with the general common-sense laws of personal hygiene.

From this comparison of medical casualties which were seen at a base hospital it appeared that the younger and less acclimatized American troops reacted in their development of diseases differently from the older and more seasoned British soldiers. Each body of men tended to have the same common illnesses but in different proportions. The British had many cases of trench fever and trench nephritis. These diseases were comparatively uncommon among the Americans. Respiratory infections and especially those following influenza, were more common and more serious among the Americans than among the British. The Americans had more casualties from diarrhea and indigestion, while the British suffered more from casualties due to physical strain and fatigue. Finally, the Americans more than the British seemed to develop an acute exacerbation of any chronic or latent disease to which they had any tendency from inheritance or previous history. These differences were due, among other reasons, to the fact that a certain number of men constitutionally unfitted to military life had not been weeded out from the Americans at the outset, and that there were too few officers and non-commissioned officers who were trained to enforce the disciplinary and hygienic measures designed to keep medical casualties as small as possible.

OPERATION OF SPINAL DECOMPRESSION.

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The operation of laminectomy for "spinal decompression" in cord lesions has a place in surgery comparable to that of cranial decompression in lesions of the brain. The value of operation for cranial decompression, especially that of subtemporal decompression in supratentorial lesions, has been well recognized for years. That laminectomy for spinal decompressions or for exploration is of equal if not greater value is not yet generally appreciated. It has in the past been employed but rarely, and then usually at the wrong time, and as a last resort when all other measures have failed and the nerve tissue irreparably damaged. And yet there can be no

doubt that in patients having obscure lesions of the cord or in doubtful diagnoses an exploratory laminectomy, frequently terminating as a simple decompression, has been followed by remarkable improvement of the patient. The spinal operation has an advantage over the cranial decompression, for though a cranial decompression may be used for an exploratory procedure the lesion itself can rarely be removed through the original incision; so that a second operation, the formation of an osteoplastic flap, is frequently necessary. But in spinal laminectomy the major part of the cord at the supposed site of the lesion is before the eye of the operator for exploration, and spinal decompression, exploration and possible removal of a lesion can be carried out at the one operation. Furthermore, diagnosis and localization of cord lesions is more accurate than the lesions of the brain. With the advance in surgical technic of recent years spinal laminectomy for exploratory purposes is becoming more and more recognized as justifiable and of small risk.

It is the purpose of this paper to discuss the value of exploratory laminectomy in cases of doubtful diagnosis or lesions of obscure origin which can be localized, and the value of spinal decompression in certain selected cases of well-recognized forms of cord disease which formerly were not considered amenable to surgical interference. Fractures of the spinal column with loose or depressed bone fragments and extramedullary tumors have for years been subject to operation and will not be considered in detail.

Recent Fracture. In recent fracture of the spinal column, with involvement of the cord, laminectomy is urgently indicated even though there is no evidence that bone fragments are compressing the cord substance. An early decompressive laminectomy will allow the removal of blood clot, but, what is more important, will avoid the compressive effect of edema in and about the cord, which is always present, and sometimes in large amount, after every trauma to the cord. By laminectomy is meant operation after the patient has recovered from the shock, twelve to thirty-six hours after injury. Of course, laminectomy should not be considered while the patient is in a condition of shock.

Naturally a simple bone decompression with opening of the dura will be of no avail to the cord fibers already destroyed by the trauma. But by removal of hemorrhage and edema by an early laminectomy the sound fibers and many of the damaged ones will be preserved which otherwise would be destroyed by the compressive effect of the edema. In the past the harmful effect of compression by edema in cord trauma has been overlooked. In several cases of fracture of the spine operated upon by the writer by early laminectomy the cord (which normally lies loosely within the dura) was so swollen and tense with edema and filled the dural sac so completely that it was necessary first to incise the dura at a point well away from the site of injury and allow the fluid to escape. This was necessary not only

to avoid injury to the swollen cord by direct incision but also to prevent a possible extrusion of cord substance through the dural incision if made directly over the point of swelling. No one who has encountered a condition such as this could fail to be convinced that if not relieved by operation such intense compression, even though by fluid, must cause severe damage not only to the injured fibers but also to the normal ones.

That edema alone can cause severe compression of cord fibers was well demonstrated in experiments carried out on animals by the writer some years ago in an effort to determine the primary causative factor in spina bifida.[1] Through a small laminectomy wound at the cervical dorsal junction in rabbits and puppies salt solution in variable quantities was injected under the spinal membranes both by gravity method and by syringe at moderate increasing pressure. Escape of fluid upward was prevented by cotton pledgets. Shortly after the entrance of the salt solution there were signs of irritation in the lower extremities (jerking and twitching of hind legs), followed as more fluid was introduced, by paresis of the legs in varying degree in the different animals; in two cases this amounted to apparent total paralysis. As the experiments had a different objective in view (the formation of a spina bifida protrusion in the lower lumbar region), and the animals were chloroformed at the end of the experiment, there was no opportunity of learning whether restoration of function in the hind legs would have followed absorption or withdrawal of the salt solution. But leaving aside the severe paralysis caused by the injection of large amounts of the solution the irritation and paresis caused by the introduction of fluid under moderate pressure in a normal cord are indicative of the damage edema can produce on injured cord fibers and how it continues and augments the initial lesion or trauma.

Old Fractures. There are many patients with fracture of the spinal column and trauma of the cord on whom, for various reasons (failure to diagnose the fracture, refusal of operation by the patient and the still rather widely held opinion that early laminectomy accomplishes no good), no operation was performed. In many of these patients improvement later occurs, progresses in variable degrees and then ceases, the condition becoming stationary, with the patient more or less disabled. In others, following the initial improvement, retrogression sets in, the condition becoming steadily worse. In yet other cases (and these usually the ones of moderate injury) the initial improvement is slight or absent, and the signs of cord involvement become progressively pronounced. In a large proportion of these patients the roentgen rays will disclose no displacement or thickening of bone and operation, if undertaken, will confirm the negative roentgen-ray findings. And yet in many of

[1] Annals of Surgery, February 1915.

these old cases of fracture a simple exploratory or decompressive laminectomy will often give astonishing and brilliant results. Then what was the cause of the disability? The initial injury, undrained hemorrhage in or about the cord, the formation of later scar tissue and adhesions about the cord and in the arachnoid and dura that lead to the formation of sacculations filled with fluid. I have seen patients in whom the arachnoid adherent at some points and with fluid-filled sacculations at other points had the appearance of multilocular cysts. This condition alone, by compression, is capable of giving rise to marked signs of cord impairment. When such a condition is encountered the arachnoids should be widely opened, adhesions divided to allow the proper flow and return of spinal fluid and to prevent sac or cyst formation. Under no circumstances should the attempt be made to dissect scar tissue from the cord. If this is attempted the condition will almost certainly be aggravated. As stated above, remarkable improvement will often follow an exploratory laminectomy even in those patients with old fracture of the spine. Two such cases were reported in a former article.[2] One of these, a coal miner who suffered a fracture in the lower spine from a fall of rock, had been an invalid for eighteen months, able only to get about with crutches. Six months after an exploratory and decompressive laminectomy he was able to do desk work, using neither crutches nor cane. He continued to improve so that two years after operation he returned to his work as a miner. Six months later he was killed by a second fall of rock.

The condition of increased intraspinal pressure (due to accumulation in excess of cerebrospinal fluid), similar to the corresponding condition intracranially, is the one lesion above all others of the nervous system that can be most successfully and safely treated by surgical means. Strictly speaking, increased pressure, whether intracranial or intraspinal, is not an independent lesion or clinical entity, but is rather secondary to some underlying lesion. Yet it is so frequently met with, its power to damage the nerve cells and fibers so great, the signs of its presence so readily ascertainable and its removal so promptly followed by improvement, as almost to raise it to the dignity of a distinct disease entity.

Multiple Sclerosis. That disseminated sclerosis, with its widespread and multiple lesion scattered throughout the white areas of the cord and brain stem, could be benefited by surgical intervention may well be doubted. And this is true in typical cases in which the optic disk pallor, nystagmus, tremor of hands, absent abdominal reflexes and spasticity of legs bear witness to the widespread nature of the disease. There are other cases of multiple sclerosis in which the signs point to a focussing of the disease process in the lower part of the cord, as shown by the greatly exag-

[1] Am. Jour. Med. Sc., December, 1916, No. 6, cli, 865.

gerated tendon reflexes and marked spasticity of the legs and a definite increase of fluid at lumbar puncture and comparatively little involvement of the upper part of the brain stem, as disclosed by little or no tremor of hands, no nystagmus and absence of pallor of the optic disks. And in certain cases of this latter type remarkable improvement has followed a simple laminectomy. Some of these patients show a definite sensory level zone about the lower thorax or abdomen, leading to the assumption that we are dealing perhaps with a cord neoplasm. Indeed, the first of these cases reported below was operated on with that diagnosis in mind, and it was only after the dura was opened that the condition was recognized as multiple sclerosis. Improvement was so definite that the two following cases of undoubted multiple sclerosis of the edematous type just described were operated upon with positive improvement in one case and slight in the other. We have operated upon four such cases, two of which show definite improvement, the third an astonishing result, in that whereas the patient came into the hospital markedly disabled on crutches, he walked out three weeks following a decompressive laminectomy with a cane only. His present condition after two and a half years is definitely improved. The fourth case was one in which the sclerotic process followed severe trauma to the lumbar spine some years before and the roentgen rays disclosed marked thickening of the vertebral laminæ. He was operated upon because of the roentgen-ray findings rather than for multiple sclerosis. No improvement whatever followed.

While we cannot be positive as to the etiology of multiple sclerosis, there is much evidence to support the view that the predisposing cause is faulty metabolism, an absorption of toxins, probably of intestinal origin. Trauma to the spine, perhaps slight in character, may be regarded as the exciting cause, for the signs of the disease rather often follow closely upon the receipt of an injury and make their first appearance in the neighborhood of the trauma.

But whatever the cause the pathology of multiple sclerosis would lead us to doubt strongly that in the presence of a disease process so widespread and deep-seated in the cord, possible benefit could result from the creation of a gap in the bony canal and membranes by a simple laminectomy; and yet in view of the above and other reported cases it is not possible to doubt but that in certain selected patients having multiple sclerosis a decompressive laminectomy is followed by definite and marked improvement. Whether this improvement is due to the removal and subsequent subcutaneous wound drainage of cerebrospinal fluid, which was found to be far in excess of normal in all the above cases, or whether there is a real modification of the sclerotic patches by alteration of the blood supply following operation, is impossible of verification. In two of the above cases the cord was somewhat shrunken in size, and in all four there was an excess of fluid. Yet the fluid soon recollects. In

the writer's opinion improvement was caused by increased nutrition of the cord due to alteration in the blood supply. That the improvement following decompression operations in multiple sclerosis is or will be permanent is open to question. Unless in an early exceptional case, it is difficult to conceive that such a measure will be followed by the disappearance of the sclerotic patches with restoration of function. Yet the improvement in the patients referred to above and in other patients has been so definite and relief so marked that even were the relief to last only two or three years the operation would, in the writer's opinion, be a valuable procedure in the face of the increasing spasticity and disability.

SYRINGOMYELIA. Syringomyelia is characterized by cavity formation within the cord, about the central canal. The basis of the process is a congenital anomaly of development affecting the central canal or nests of glia cells persisting from fetal life, remaining quiescent for years and under the influence of some irritant, proliferating with first tumor and later cavity formation about the central canal. The disease process is usually located in the cervical and upper dorsal region of the cord and is slowly progressive, extending in a longitudinal direction, and gives rise to marked and well-defined motor and sensory impairment. Trauma of the spinal column very frequently precedes the formation of syringomyelic cavities, which may become filled with fluid, compressing the cord substance and giving rise to severe sensory and motor impairment. Trauma of the spine also very frequently precedes the formation of tumor of the cord either intramedullary or extramedullary, while in frank, typical cases syringomyelia and cord tumor can be rather readily differentiated, yet in atypical conditions, such as a lateral position of the tumor or a sharply localized position of the syringomyelic cavity it may be impossible to make a positive diagnosis. Naturally, if the diagnosis is tumor, the only procedure possible is operation; and if at operation instead of tumor the condition is found to be a syringomyelic cavity distending the cord the proper procedure is to drain the cavity and keep it drained by a method described below. Indeed, in certain cases of well-developed syringomyelia in which the signs point to the existence of a single cavity which does not involve the bulb, as in the lower cervical or upper dorsal region, and when the increasing intensity of the symptoms point to progressive distention of the cavity with fluid rather than to a spread of the disease process, it is, in the writer's opinion, justifiable to operate for the drainage of the cavity. One such case operated upon two and a half years ago had flaccid atrophic paralysis of both arms and spastic paralysis of the legs, with dissociated sensory disturbances. Impairment was such that the arms were almost useless, hanging loosely at the side, and he walked with difficulty. Laminectomy was performed in the lower cervical region and a funnel-shaped enlargement of the cord found extending from the fifth

cervical to the first dorsal segments inclusive. A longitudinal incision of the cord in the midline allowed much fluid to escape; the cavity was over two inches long and about one-third inch in diameter. Fine strands of linen thread were introduced into the cavity and the ends carried upward through the laminectomy wound and implanted in the muscle. Improvement was observed before the patient left the hospital. He continued to improve during the first year following the operation, in that he was able to raise the arms to the head, comb his hair, feed himself, etc., but never gained the power of raising the arms above the head. He walked with a less spastic gait. Since then his condition has remained stationary.

Naturally, operation is not advised in all cases of syringomyelia, especially when atrophy is extreme, but only in those patients in whom the medulla is not involved and in whom the signs point to the existence of a single cavity, with increasing distention of fluid—in short, in the selected patients described above. Whether the relief obtained will be permanent is doubtful. Certainly, the marked improvement this patient has shown for two and a half years makes the operation a justifiable one in selected patients.

Unclassified Cases. In addition to these well-defined conditions of spinal-cord disease or lesions, which may be benefited by operation, cases of cord involvement are seen quite frequently, in which only a tentative or possibly no diagnosis can be made. The obscure origin of the lesion or the unusual nature of the cord symptoms may make a positive diagnosis impossible. Naturally, if improvement occurs shortly and steadily progresses operation would not be considered. But if the signs of cord impairment remain stationary or further impairment occurs an exploratory laminectomy is not only justifiable but is imperative, even though the nature of the lesion cannot be diagnosed. Though in some of these patients operation will disclose a condition that will not be benefited the risk of the operation is slight. In other patients decided benefit and at times brilliant results will be obtained. The history of the following case is interesting as illustrating the observations noted above:

S. G., aged thirty-one years, cabinetmaker. In September, 1917, a small abscess appeared in the left nostril and was incised. During the following three months abscesses appeared in succession in the left orbit, the left cheek and the left side of the neck back of the ear. The last abscess was not healed until January, 1918, at which time he complained of pain and stiffness of the neck. A diagnosis of cervical Pott's disease was made and the head and neck immobilized by a stiff brace, which he wore for six months. In June, 1918, five months after the brace was applied, he noticed a numbness of the right hand and weakness of the left arm and hand. In one month this had progressed to a left hemiplegia (face not involved), with

sensory disturbances over the right half of the body (excluding the face). The condition was now diagnosed as luetic bone disease of the cervical vertebræ. Two blood Wassermanns at this time were negative, and later two blood Wassermanns and one spinal fluid Wassermann were also negative. Notwithstanding these findings salvarsan was given intravenously; no benefit followed. Two radiographs in July showed no apparent bone lesion. Seen by the writer in November, 1918, examination showed a left hemiplegia. He walked with difficulty, the legs being very spastic; left ankle-clonus and a left Babinski were present. The left arm also was spastic. Could raise the arm slightly and flex and extend the forearm slowly, but could not move the hands or fingers. On the right side there was tactile, thermal and pain hypesthesia on the inner side of the foot, leg, and in areas over the right thigh and trunk; marked hypesthesia of the right hand and in areas over the forearm; no total anesthesia. Two radiographs of cervical spine at this time showed apparently normal bone. As signs and symptoms were stationary an operation was not considered advisable at this time, and he was kept under observation. In January, 1919, he complained of beginning weakness of the right hand and arm, and an examination confirmed this. The right-sided sensory disturbances were unchanged. There was some tenderness to pressure in the left side of the neck at the level of the third cervical vertebra. The signs pointed to a lesion, nature unknown, at the level of the third and fourth cervical segments. Examination of the pharynx disclosed a small sinus running downward toward the body of the third cervical vertebra. In view of the beginning motor impairment of the right side of the body an exploratory operation was advised. Laminectomy was performed January 29, 1919. The laminæ of the fifth, fourth, third and part of the lamina of the second cervical vertebræ were removed. The dura was tense and deeply indented on the left side at the level of the third vertebra by a small projection of bone (exostosis) into the canal. This was removed and the dura rounded out. There was no evidence of other obstruction in the canal either above or below the field of operation. Dura incised and fluid spurted to a height of seven inches for ten to fifteen seconds despite the fact that both head and trunk were below the level of the incision. The exposed cord appeared normal and a probe passed upward and downward disclosed no intradural obstruction. The dura was reclosed and the wound was closed with one drain. The head and neck were immobilized by a molded plaster-of-Paris splint.

Eight days after operation he moved the left foot and left fingers more freely than for six months. Three weeks after operation he could flex and extend the fingers of the left hand separately and could put his hand on top of the head and walked with less difficulty. Four months after operation he walked well without a cane;

could use the left arm freely almost as well as the right arm, though somewhat awkwardly. Power in the left arm and leg was good and he could use the arm and leg almost normally, though a trifle uncertainly. Could write legibly though poorly. (He was left-handed.) His chief complaint was numbness of both arms and hands, but examination showed very slight hypesthesia. The areas of marked hypesthesia on the right leg were still present. The lower tendon reflexes were still marked, more so on the left side; left ankle-clonus was present, also a left Babinski. He is steadily improving. Even after operation I am unable to make a positive diagnosis of the lesion, but consider the following to be the most probable:

Osteitis of the second and third cervical vertebræ, with inflammatory reaction in cord meninges and retention of fluid, or thrombosis or pressure obstruction of the spinal vessels of the left side of the cord at the level of the second and third vertebræ.

Technic of Laminectomy.—A vertical incision is made in the median line over the spinous processes. The muscles are incised close to the spinous processes on both sides and the incisions packed with hot gauze. With a broad-bladed periosteal elevator the laminæ are freed of muscles the whole length of the wound and a large self-retaining retractor inserted, which effectually checks venous bleeding and presents a comparatively dry field. The ligaments of the spinous processes are then divided and the processes removed by large special ronguers. The laminæ are rongeured away, laying open the spinal canal and exposing the dura. This completes the first stage of the operation and should be performed rapidly, both to minimize the loss of blood and to afford leisure for the delicate and sometimes tedious intradural procedure. The spinal canal is then explored by means of a probe or grooved director on all sides both above and below the operating field. Naturally, if suppuration is encountered or suspected in the spinal canal, extradural, the dura would not be opened; otherwise the dura is incised and a similar exploration carried out. If a removable lesion is found, as tumor or blood-clot, the dura may be reclosed. If the operation is a decompression one for a known lesion, such as fracture or multiple sclerosis, the dura is left unclosed to permit of decompression. Unless the dura is opened and allowed to remain open, bone decompression will avail nothing. In other conditions also the dura should not be closed, *e. g.*, intramedullary tumor exposed by splitting the posterior columns or for drainage of a distended syringomyelic cavity. The third stage of the operation is the closure of the wound in layers by chromic gut, using care to have the muscle layers well approximated, leaving no dead spaces. I prefer a single drain of rubber tissue running to the depths of the wound for the drainage of wound fluid. This is removed in twenty-four to forty-eight hours. A molded plaster-of-Paris splint will give support to the spinal column and comfort to the patient. There is little or no pain following the operation, and opiates are seldom necessary.

PROMINENT FEATURES OF THE PSYCHONEUROSES IN THE WAR.

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The subject of psychoneuroses occurring in soldiers in the great World War has already a voluminous literature. It is not my intention to describe the various psychic, motor, sensory and vasomotor phenomena found in these conditions, but rather to describe some of the features of special interest.

All writers agree that the designation "shell-shock" is an unfortunate one, as it connotes an etiological condition absent in a large number of cases and not a disease entity. The term included all sorts of functional, organic and psychic conditions. Even the term "war neuroses" has no more real reason for being than had the term "railway spine," formerly much discussed in connection with railway injuries and now rarely mentioned. True, the neuroses occur in war, but fundamentally a hysteria or a neurasthenia in war and one in peace are the same, though the color of the symptoms may differ. Practically none of the phenomena observed in this war are absent in a series of cases found in civil life. So it is more correct to refer to them as the psychoneuroses found in war.

I can hardly agree with a well-known English authority when he says he has not seen a true case of neurasthenia in this war. True, hysteria in its different phases has been the much more frequent reaction-type, but neurasthenia has been quite frequent. I have seen a number of cases soon after they came from the battlefield.

I have seen hundreds of cases of neuroses in the seven months after the signing of the Armistice, and from my observations I would say that in these late cases I have found much more frequently a constitutional neuropathic or psychopathic condition than in the cases found during the active period of the War.

The term "shell-shock," first used by Myers in the London *Lancet* in February, 1915, was early objected to by Henry Head, of London, as being inappropriate, representing a mass of unallied nervous conditions. The term, of course, was meant to include only cases of the neuroses.

In my opinion the association of various endocrinopathies has been incidental in the larger proportion of cases. We know that an endocrine disturbance, as a hyperthyroidism, can be made much worse by the horrors of war, and, again, may very well be an important factor in the development of the neurosis; it may act physically, as through the cardiovascular mechanism, blood, etc., and

mentally through the irritability, irascibility, instability, etc., present in these cases. The importance of the endocrine system and the autonomic nervous system, in those cases designated as disordered action of the heart or cardiac neuroses, is of the greatest importance. The physical exhaustion was important in these cases as an etiological factor. There may be, hypothetically, certain physical and chemical secondary changes; of these we know little at the present time.

As to the frequency of the neuroses, hysteria greatly outnumbered the cases of neurasthenia. Personally, I do not accept the views of the French psychopathological school as to psychasthenia, believing that the larger number of these cases are cases of hysteria. This is the view, I think, which is held by most men of the Swiss and Austrian schools. Their interpretation is a much better one, being more analytical and therefore really more explanatory, the former being chiefly descriptive.

The underlying mechanism in the neuroses in war has been easier to study than similar neuroses in peace times, as the subconscious conflicts were much more superficial. This is true of most of the cases excepting the chronic ones, especially those occurring since the Armistice. Their neuroses were related more to peace conditions than to conditions of war.

It is, of course, important to study the soldier's make-up—that is, his ordinary and habitual way of reacting to stimuli, etc. In fact, unless one makes a study of each patient's make-up the symptoms of the disorder will mean but little to him, for the same symptom-complex in various types of personality has different meanings. It is just as important to know this as it is for a man who is building a bridge or a building to know the nature of the material which he is using.

In these cases, especially in the ones accompanied by anxiety, who came to us in the hospitals in France and England direct from the battlefields, we noted that distressing dreams of battle, bombing aeroplanes, etc., were very common. But we cannot agree with one well known authority who stated that the prognosis in these cases was invariably bad. It was if one refers only to their future use as combat soldiers. Most of such cases that I saw made a prompt recovery, but they were not returned to the firing line. The cases we now see in the United States do not, of course, have such terrifying nightmares. The psychological explanation is evident.

Man's ideals as to right, justice, his relations to his fellow-men, toward cruel practices, living like animals, uncleanliness, etc., had to be altered, when the objects of the War became paramount. It was necessary for them to forget many of their cultural lessons, and some of them could not do so. .

That other factors besides those related to the War and their own ego must be present, is evident from the fact that nearly all

soldiers were able to go through the worst perils and privations of the war without developing any neurosis whatever. One must not, as I have seen done in England, call a simple case of pure physical exhaustion a neurosis of the type which we are discussing. In such cases a few days' rest usually effects a cure.

In nearly all cases of the neuroses anxiety was a prominent feature, not only in pure anxiety states but in conversion hysteria, heart neurosis and cases with a marked hypochondriacal trend. In some patients the entire syndrome was centered about this morbid anxiety.

The lack of sleep, whether from the arduous work in the trenches accentuated by a state of anxiety, or from other causes, was an important factor in delaying recovery. Rest and sleep as we well know are the best means for combating fatigue, there being no direct biochemical means for curing it.

Fatigue may not only be due to physical causes but to various disturbing emotional states—distaste, disgust, resentment, fear, etc. —which are all important factors in its determination. All strong emotions result in some sort of an upheaval and the patients must have an outlet for the energy generated. If retained in the organism the emotion produces symptoms of a neurosis. A sympathetic nervous or an endocrinopathic disturbance often coexists in these cases.

In general, it might be stated, that the soldier with numerous interests recuperates much more rapidly than the man who has little or no interests. The tendency to chronicity is especially noticeable in these latter patients, especially if they were of the indifferent or asocial "shut-in" type, for they had no outlet to their pent-up energy and their introspection and ruminations made their condition worse.

A careful neuropsychiatric examination will rule out genuine cases of cerebral concussion. In speaking of cerebral concussion, I might say that in over half of the hundreds of cases of neuroses which I have seen in this War, in hospitals dealing with psychoneurotics chiefly, the question of being exposed to shell explosion did not enter at all. I have seen many such cases suffering from neuroses who never reached a position nearer the firing line than Liverpool.

In order to understand the neuroses, especially hysteria, one must realize the great dynamic value of an idea, which has intense value to the particular individual. An idea clothed with a great deal of feeling (affect) we call a complex. Hysterics react more quickly and more vividly to an idea or a situation that touches or irritates any of their complexes, than do normal individuals. By the subconscious associations operating in hysteria an idea can be transferred into a physical symptom (conversion hysteria). The history, with a careful neurological examination, will show that the condition is not organic in origin. I might add here that I have never seen a

functional paralysis in an officer, though they were moderately frequent in the men. Pure anxiety states are very frequent in officers, however.

The causes frequently given as precipitating the neurosis are often the so-called "last straw"; they are the exciting causes, but not the principal ones. The principal cause or causes one usually has to abstract from the psyche, and this takes time and necessitates a long training in psychological medicine.

One regularly notices that the patient who pays too close attention to his symptoms is thus favoring their progress and continuance. One notices this especially among the inadequate type of patients, and since the Armistice, among that class of patients who do not seem to make a very heroic effort to get well. One wonders about this, and yet there is no doubt about it. The cases of two lieutenants in the Quartermaster Corps, who broke down in France in November, 1918, who were diagnosed neurasthenia in one case and hysteria in the other, and whose conditions were supposed to be due to overwork and not to battle stress, come to memory. They were with a number of other officers whom I brought back from France in March, five months after their illness began, and in June, three months later, they still complained of trivial symptoms of no moment. To me a few factors are always in evidence in such cases.

Besides the neurosis, one nearly always finds some marked psychopathic traits, if not definite psychopathic states; their home relations, financial state, etc., are often anything but ideal; the will to get better is absent. A neurotic patient who really does not want to get better rarely does.

Two symptoms which all medical men have noticed in this War have been stupor and mutism. The mechanism in these cases is usually easy to work out; the object is to shut out the surroundings and its incidents.

The mechanism and the motive for the hysteric's illness is not in awareness; but by treatment the subconscious associations were brought to the surface, and one then had the patient well in hand; the mechanism became clear to him, and the soldier then recovered. For to remain sick after one knew he understood the mechanism, or to refuse coöperation with the physician, would mean that he consciously would prefer his symptoms, and this would constitute malingering. I saw very little malingering during the war, though I observed especially for it, and was on neuropsychiatric boards in the United States before going abroad, where we examined about 105,000 troops. In the past year and a half since then my experiences have been the same. What few cases I have seen since the Armistice who might be put down as malingerers were patients who did not seem to want to get better, and who preferred their present position than to recover and go home. The signs usually mentioned to distinguish the really sick man from the malingerer—

as the drawn facies, rapid pulse, his frankness and desire for expert examination—are valuable, but the really important thing is to carefully observe his attitude and reactions.

It is better and nearer the truth—and the distinction is not unimportant—to say that a malingerer simulates a symptom, whereas in hysteria the symptom is simulated. This is another way of saying that in malingering the symptom is consciously, in hysteria unconsciously brought into being.

The distinction is fine, but there is a great difference between a conscious act, and one brought about by subconscious motives and associations of which the patient is not aware. He certainly is not aware of the relation to the symptoms. Malingerers are nearly always psychopaths. I have never seen a soldier feign insanity, with possibly one exception. This soldier was exaggerating certain psychopathic traits and trends.

In the beginning of the War men like Frederick Mott, the noted London neuropathologist, Sir John Collie and others tried to explain too much on an anatomicopathological basis, which viewpoint later became untenable.

In some patients one saw that the antagonism to the horrors of war was at times conscious. But the important feature is this, that the patient does not realize the connection between his symptoms and the wish to get away from it all. Were the wish a conscious one, and if the patient could justify his wish—at least to himself—there is then no conflict and naturally no neurosis. The soldiers who broke down said they wanted to get better and (during the war) wanted to get back to the fight; and they did. They never consciously wanted to get out of the service.

In all of these patients I took the attitude that the same conflicts would arise again, and they would readily break down again. So in spite of their frequent remonstrances I told them I would transfer them to a non-combatant unit. I never sent one back to the United States, but told them that they would be able to serve their country in the A. E. F. The results were perfectly satisfactory to everyone. In all of them a study of their subconscious psyche, *i. e.*, a study of the content of their dreams and nightmares, the results of association tests, etc., always revealed their real subconscious desires. To tell them of these bluntly would do no good but would be promptly resented; this is especially true of officer patients. But if one brought the facts out in the proper way, they could be accepted and were accepted always without opposition, for I always showed them that it was not exactly unnatural for the instincts of the ego to predominate over the ethics of the species, that the instinct of self-preservation could not be ignored always, nor by everybody.

As in peace times the neurosis furnished a tolerable situation. In these patients a lively instinct of self-preservation, a poor con-

trol over the emotions and a poor will, with various individual subconscious factors, conflicted with their sense of honor, patriotism, duty and their conscious desire to "carry on." This brought on the military disqualifying symptom or syndrome, constituting the hysteria.

There has been a great deal of speculative theorizing on the subject of the neuroses of war which has not made the question any clearer. Thus Sir John Collie writes that most cases of "shell-shock" are due to concussion(?), but that by the time we get them the first pathological changes have disappeared. This assumption is certainly erroneous in the large majority of cases. His ideas are purely descriptive; no attempt was made to get at fundamental causes, and a pathology non-existent was declared to have been present, but was no longer in evidence. Practically none of these cases died, so the pathology is in the psyche and is not a somatic one. He would have done better had he referred to the pathology as being one of morbid anxiety.

Myers refers to certain sensory cases of what he calls "shell-shock," and says the cause might be a thalamic lesion. If there existed a thalamic lesion, it would then have been an organic case and not a neurosis. If the soldier later developed a neurosis then it would have been a secondary and not a primary one. The same criticism applies to Mott's cases, in which he described punctate hemorrhages, emboli, etc., in the medulla and elsewhere. When such conditions are found to exist postmortem, then the diagnosis should be amended and a proper anatomicopathological designation given.

In chronic cases the analysis of the personality and subconscious factors is of more importance than merely noting the symptoms. After one has ruled out all organic physical disease, the procedure is along the lines of analytical psychology or psychanalysis. In the chronic cases in war and in peace the outlook differs as to whether the constitutional make-up is normal, hysterical, inadequate paranoid, etc.

Some people still refer to hysteria in the way they do to malingering. But though a vicious and unfortunate way of reacting, it certainly does not belong in the same category as malingering. We are in full accord with the remark of Wiltshire when he says that poisoning by shell gas is only exceptionally a real cause of a neurosis.

In the chronic cases and in those cases occurring since the signing of the Armistice I have been impressed by the fact that the psychopathic taint as shown by emotionally unstable and inadequate traits has been much more in evidence. In such cases certain complexes were present, preventing recovery. So we naturally feel that the diagnosis of hysteria or neurasthenia applied to a case still ill, and which developed early in the war, hardly shows the real picture. The complaints of such patients toward the end are often trivial

compared to their early symptoms. Needless to say, most of them do not feel able to resume their work in the world. It is natural that one wants to know why. They now resemble the ordinary chronic neuroses of civil life, with various psychic conflicts. Their present symptoms are often only rationalizations for their behavior and failure to get well.

The desire to avoid pain or to gain pleasure is always present even if subconscious. In these chronic cases the question to decide is to what extent the mechanism is subconscious, and needless to say to get at the complexes and to try to make an adjustment.

In many cases one is really dealing with a personality anomaly only. It is safe to say that an ordinary neurosis would not persist for seven or eight months, except for some deep-seated complexes and often a constitutional psychopathic taint. In many such cases the hysteria or fatigue neurosis was merely engrafted on the psychopathic state, so that at the end one still has a defective constitutional make-up to deal with.

TREATMENT. There are a few interesting points in reference to the treatment of the neuroses of war time to which we might call attention.

When in England I noticed that the Babinski idea of curing hysteria by persuasion was followed almost exclusively, and the method was very successful in removing the immediate symptoms. But little attempt was made to get the patients to understand the mechanism of the neurosis; however, one reason being lack of time, the other being that but few men in England have paid much attention to the study of psychanalysis, for the subject aroused a stormy controversy in Great Britain as to its merits and otherwise.

Sir John Collie, one of the old-school neurologists, said he did not think psychanalysis necessary. Mott said: "I do not find it necessary or even desirable." Needless to say neither of them are students of the subject. Forsythe favored it, as did Rows, Adrian and Yealland. Eder, too, must have approved of it, for he said that suggestion, especially under hypnosis, and aimed rather at the complexes than at the symptoms, was good; but to get at the complexes, he must have used psychanalysis. Proctor used suggestion under hypnopsis. Myers and Buzzard regarded hypnotism favorably.

As there has been so much doubt expressed as to the need and value of psychanalysis, I think it would be well to say a few words about the employment of it in the neuroses of war. One realizes, of course, that in a majority of the cases a cure can be effected in much shorter ways. But psychanalytical training helps one to understand and to treat the cases better, especially the chronic ones.

I know of no better way of presenting the psychanalytic viewpoint than to quote some of the views on the subject as presented by Ernest Jones, probably the most eminent psychopathologist of

Great Britain. He has published a very interesting article on this question in vol. xi of the *Proceedings of the Royal Society of Medicine*, April 9, 1918.

Heredity is vague in explaining complex psychological phenomena. Suggestion merely introduces another problem.

Some factor other than stress and strain must be present to produce these conditions, for less than 1 per cent. of the soldiers developed neuroses. We all know that psychoneuroses result from unconscious mental conflicts. One can only gain access to the unconscious by some sort of psychological investigation. The etiological factors in these cases are often more complex than is usually supposed, and they are particularly individualistic. War causes an official abrogation of normal standards. The adjustment to war is very difficult for some men to make. Besides heredity and social customs, certain ideas of the early relation of the child to its parents have to be taken into consideration. In the development of his ego man comes to approve of certain standards and to disapprove of certain others. His ego-ideal is not always easily a victor, nor always fully successful.

The mind deflects his anti-ego impulses from a forbidden goal on to an ethically proper one; or their energy is repressed and a barrier is erected—so-called "defence-reaction." In this way one who is naturally cruel may become oversensitive to painful situations, etc. But as the large majority of men were able to adjust themselves to the field of war—not a conscious adjustment only, of course—they thus permitted the inhibition of the ego-ideals against the infliction of cruelties, etc. But Jones says that in all neuroses it is important to study the relation between a current conflict and a biologically older one, the current one arousing buried and only imperfectly controlled older conflicts.

Neuroses are not, as the French psychopathologists claim, any diseases that may happen to a person, but they are unconsciously produced in the patient's mind for a definite purpose, *i. e.*, they are volitional, but not by the conscious will, nor are they deliberately purposeful. There is at the bottom of the mechanism an unconscious desire to obtain a pleasure by gratifying some repressed impulse which is out of harmony with the ego-ideal. The motive is to achieve some current end by the development of a neurosis.

The neurotic symptoms are the result of the psychic conflict; the incapacity—as a paralysis, for example—fulfils the desire, against which desire the patient has been fighting (a wish fulfilment).

But the important feature is not merely that the wish is unconscious, there being different degrees of consciousness or awareness, but that the repressed wish is against the ego-ideal and is the cause of the unawareness. Jones does not believe that a present repressed wish alone can cause a neurosis (if it could there would have been many more neuroses in this war, I believe, too). It can do so only

by reviving older repressed conflicts. Where there is a failure of adjustment we notice an introversion or a turning inward of the patient's feeling (affect). The present wish becomes associated with repressed wishes of older conflicts. Such a combination characterizes neurotic disorders; they thus differ from other ways of reacting to difficulties.

There are three factors entering into a neurosis: heredity, and "infantile fixation" during evolution, and the present or current conflict. They are all related, so that if one factor is pronounced another may needs be slight to produce the neurosis. Thus with a very bad heredity an ordinary daily experience may precipitate the attack. In the neuroses of war the present conflict is of the greatest importance.

In these patients one frequently notices traits characteristic of childhood: sensitiveness to slights, being too self-centered and a desire to be helped. In the war cases the infantile repressed factor has not been sought for, yet it is very important in the chronic cases, which are hardly war neuroses any longer, but resemble peace neuroses entirely.

The reason for the greatest opposition to the psychanalytic theory is the statement that the older infantile repressed wish is a sexual one.

In the cases we are discussing the conflict has to do with the instinct of self-preservation and the preservation of the species. But a neurosis is a disorder of the unconscious imagination. So if we say the war were the only cause, that would be equivalent to saying that the neurosis resulted from a conflict of the ego-ideal and the instinct of self-preservation, which denies the former theory.

Psychoneurotic symptoms may be developed to prevent the exhibition of fear. Fear, with causeless dread and apprehension, various phobias and bodily manifestations, is really morbid anxiety. One sees it in impending danger and evil, as in anxiety neurosis and hysteria; its characteristic feature is the disproportion between its intensity and justification. It is claimed that it stands in close relation to unsatisfied and repressed sexual libido, the morbid anxiety representing the discharge of the energy. This is a defensive reaction of the ego against the claims of the unsatisfied sexual hunger; a projection outward in the form of phobias; it is the ego's fear of the unconscious. Normal fear reacts sensibly and properly to external danger, and not like anxious dread and terror, which paralyzes choice and action. The neurotic is frightened without any external danger.

Another theory of dread—morbid anxiety—is that it is derived not from the repressed sexual hunger that is directed toward external objects, but from the narcissistic part of the sexual hunger attached to the ego. Thus it is important to distinguish object libido, *i. e.*, sexual impulses directed outward; and ego libido, *i. e.*, the narcis-

sistic portion directed inward, constituting self-love. This latter is the more primary, more extensive and the less studied of the two. It may be compared to a well from which externally directed sexuality is but an overflow. I can confirm Jones's opinion that little attention has been paid to this phase of the subject by psychopathologists in studying war cases.

An excess of sexual hunger may cause suffering. There results first a discharge in the form of morbid anxiety. A perfectly normal man is free from morbid dread at all times. This war has proved that. The intolerance of narcissistic sexual hunger, with dread in the face of danger, results in an accumulated tension.

Many of the symptoms of the neuroses of war corroborate this view of wounded self-love, as lack of sociability, lack of affection for relatives and friends, the feeling that their personality has been wounded or neglected and their importance not recognized, etc. So too in such patients their unconscious idea of death is a reduction of essential vital activity, or else a state of calm, in which the ego survives, but is freed from the disturbances of the outer world.

It will be very interesting to investigate our cases with these views in mind. It was my good fortune to meet Jones in London recently, and the views of England's most eminent psychopathologist furnish food for reflection.

All will agree that psychanalysis takes time. In the large hospitals devoted especially to this class of cases, where we admitted hundreds of patients per month, we could not go into the psychological mechanism in all the cases. One observation which I would like to make, however, is the relatively large number of married neurotic soldiers who gave a history of severe marital upsets, as unhappiness, separation, divorce.

I think we will all agree that hypnotism alone is bad on psychological grounds, as it does not remove the causes. The same applies to suggestion but not to psychanaylsis.

Mott disclaimed hypnosis, claiming that it was undesirable. Mott, however, being a neuropathologist, his opinion in these matters does not carry the weight that it would were he speaking of organic conditions. We might add here also that neither suggestion nor hypnopsis alters the state of the patient's mind.

In treating these patients one should lighten their burdens and protect them from unsympathetic surroundings, but should not foster their symptoms by misplaced sympathy. In many of the emotional patients I secured good results in the acute stage of their illness by complete isolation. First rule out any organic or metabolic disorder; then the treatment is individualistic and essentially psychobiological. Rest is the best aid in the acute stages, both mental and physical rest. In order for them to secure mental rest, however, their conflicts must be brought to light and an adjustment made.

Later in the course of the disorder, too much rest or lounging, and

a failure to provide productive occupations help to keep up the symptoms. I have seen hysterical paraplegics who had been bedridden in surgical wards for a couple of months, chop down trees a few days after coming to the neuropsychiatric wards. The will to work is very important. It is self-evident that the loss of the work habit is disastrous. The wish to be cured is essential. A careful and systematic examination makes an impression on these patients; it therefore has therapeutic value. The patient must be made to realize his obligations. Any asocial tendencies, as well as hypochondriacal trends, must be combated. Do not allow the patient to develop an attitude of chronic invalidism. Treat the patient and his disordered personality: they are of greater importance than the symptoms.

The reëducation of the patient must not be confined to a mere restoration of his lost physical function, but must also include the correction of any defects of feeling, will or intellect.

Electricity and massage are used almost entirely for their suggestive influence. Any concomitant physical disorder must be treated according to the dictates of rational medicine.

A very important point to remember is that one's self-assurance of success has greater effect on the patient than any direct reasoning one may employ. This is nothing new, but physicians often disregard this dictum, and we see neurotic patients frequently going to various frauds and quacks who succeed just because they apply this point with emphasis. The hypersuggestible patients have full faith in the assurances.

The neuroses of war have taught us but little that is new. But because of their frequency and the widespread interest that has been taken in them they will probably stimulate physicians in the future to take a greater interest in the neuroses of civil life.

LOCALIZATION OF TUMOR METASTASES.

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The term metastasis as applied to tumors is generally held to mean generalization of a growth by formation of secondary deposits throughout various tissues and organs of the body and not directly connected with each other. But this is really not an all-embracing

definition, for the conception of metastasis requires not only deposit, but subsequent growth of the misplaced tumor cells, with replacement of the physiological tissue by the tumor. Thus all kinds of cells, including bacteria, may become dislodged from their original focus and be arrested in different situations, but we can only speak of a metastasis when this new location is involved by disease; for the passive lodgment of foreign cells may be, and frequently is, followed by their destruction or quiescence. The appearance of foreign cells in an organ or tissue is therefore significant and practically important as a step toward metastasis, but in itself is not proof of it.

This important point has not received adequate consideration in recent experimental work on the artificial production of cancer. The fact that, on artificial stimulation by lipoid solvents and other irritatants, proliferation of cells has occurred and that some of these newly formed cells have been disconnected and have reached neighboring tissues and even lymph glands by means of the lymph stream, is no proof of their metastasizing quality or even true tumor character. This proof is furnished only then when it can be demonstrated that these cells are not only carried by a stream and arrested in a tissue, but possess the ability of growth and organization to a tumor and the power of replacement of the physiological tissue.

The same strict interpretation of metastasis must be applied to spontaneous tumors. If, for example, we find on microscopic examination tumor cells arrested in the capillaries of the lung which they have reached by a massive break of a growth into the venous system, we are not really justified to speak of a metastasis in the lung, although that is often enough done. In infections the evidence of the disease is the anatomical lesion. Just so, in tumor metastasis the evidence is growth of tumor tissue into and annihilation of physiological tissue by it.

Emphasis is put on this point not only because of the previously stated erroneous interpretation placed on the appearance of arrested, disconnected cells in experimental cancer production in animals, but because an investigation into the problems of tumor metastases is rendered impossible by lumping the occurrence of tumor emboli with actual growth of tumor cells; for the problem of tumor metastases is not to be found in the transport and arrest of cells but in their growth to a tumor tissue. Upon this depends the unique encroachment and replacement of physiological tissue, which are the genuine attributes of metastasis.

One other point is not sufficiently appreciated, especially by clinicians, and needs explanation at the start. It is generally assumed that the histological picture is an almost absolute expression of the biological character of a growth; in other words, that malignancy and formation of metastases go hand-in-hand with the

immaturity of tumor components, that tumors of embryonic undifferentiated parenchyma are malignant and metastasizing and tumors of mature cells and arrangement benign and local.

A more profound consideration of this statement will show that this idea is untenable and cannot be upheld as a general law of tumor growth; for we know a number of tumors of embryonic tissue which do not, or at least very rarely, generalize. These are the sarcogliomata; congenital melanomata (nevi); spindle-cell sarcomata or endotheliomata of the dura mater; the epulis; many sarcomata and cancers of the ovary, of the uterus and of the mediastinum; sarcomata of the fascia; the teratomata and the embryonic growths or remains of the gut and the appendix. These tumor types may exist for years, are often an accidental finding, and do not, except in rare instances, exhibit any tendency to infiltrate and metastasize, although they may locally recur after excision.

On the other hand the reverse is also true, for anatomically mature so-called benign tumors will occasionally lead to secondary growths. This now well-established fact has been observed in fibromata, myxomata, lipomata, gliomata of the retina, angiomata, enchondromata, myomata and typical thyroid tumors.

This interesting and practically important fact was already well known to Virchow, but especially emphasized in the brilliant discussion of tumor growth by Cohnheim in his lectures on general pathology. So much were Virchow and Cohnheim impressed by these observations that the former believed that malignant properties in a tumor were subsequent to an innocent period, and Cohnheim, going further, advanced the view that malignancy and power of metastasis were in no way dependent upon the nature of the growth. To the contrary it was his opinion that infiltration and metastases depended upon the condition of the surrounding tissue. Cohnheim, following the reasoning of Thiersch on the primary development of cancer, attributed the occurrence of metastases to a removal of the physiological resistance in the invaded tissue. He attempted to support this idea experimentally by artificial introduction of periosteal flaps into the pulmonary circulation through the jugular vein. He and Maas observed in such cases the formation of thrombi of periosteal tissue. Within two weeks occurred growth of periosteal cells in these vessels to cartilage and bone. Then, however, they regressed, did not invade the neighboring tissue and finally succumbed. The conclusions which Cohnheim drew from these and similar observations of Goldtzieher and Schweninger were that regression occurred because the foreign cells were unable to resist the metabolism of the physiological tissue. Consequently, Cohnheim applied these ideas to the problem of metastases: "Only when and where tissues are lowered in their physiological matabolism by age, atrophy and inflammation will metastases be possible."

A study of tumor metastases carried on in a series of ninety-eight

successive cases of metatasizing tumors of various kinds and derivation in the laboratories of the Royal Victoria Hospital and of McGill University has revealed that in the localization of metastases two determining factors exist, viz., quantity and quality of tumor cells. It appears that in these respects tumor cells may be compared to invading parasites. In one as in the other instance the manner of invasion as well as the quantity introduced are naturally of great importance. It may be compared to the well-known difference of tuberculous infection, in which much depends upon how and how many tubercle bacilli invade an organism. When ordinarily a relatively small number are introduced and moved along by the lymph stream, they are anchored by certain tissues more readily than by others, and it is well known that the lungs, quite apart from mechanical considerations, are most susceptible to the insults of this microörganism.

On the other hand, when tubercle bacilli are poured in large quantities directly into the blood stream or even lymph stream such an elective action and localization do not occur and disseminated miliary tuberculosis develops in practically all organs of the body.

The first instance illustrates qualitative selection, the second simply quantitative overwhelming of the body by the infecting agent.

Similar conditions are found to prevail in the manner and method of some tumor metastases. In a case of small prostatic cancer, so small that only microscopic examination revealed it, practically all organs of the body were the seat of small, nodular, multiple metastases, closely resembling miliary tubercles, and clinically the case had been diagnosed as miliary tuberculosis. Careful microscopic examination of this prostate showed an unusual rupture of small tumor cells into small veins of the prostate, and from these the generalization had probably occurred.

A similar generalization is more frequently seen in the so-called hypernephromata or renal cancers. Here our laboratory records show a not infrequent massive rupture of softened tumor masses into the renal vein and extension *en masse* to the right heart and lung. In one case of a male, aged fifty-four years, a tumor thrombus extended from the right renal vein through the vena cava and the right auricle into the right ventricle and, apparently following the blood current, into the pulmonary artery. The smallest branches of this artery showed tumor emboli and, simulating miliary tuberculosis, small tumor growths in the parenchyma around them. Similar tumor plugs were found in the iliac veins and metastases in the liver and spleen.

These and other cases illustrate that even cancers may travel by the blood stream and that this path of dissemination, together with a large quantity of tumor cells thus introduced, dictates the distribution of the metastases.

Turning now to the frequent metastases in the regionary glands in close proximity with a tumor, several factors must be considered.

In the first place it is practically important that not all enlarged glands in the neighborhood of tumors are the seat of metastases. They are frequently simply inflammatory enlargements. It may be said that this is the rule in the enlargement of the pelvic glands in cancer of the uterus and in the lymph glands of the neck in cancer of the tongue, and is even frequently seen in the portal glands and mesenteric glands in cancer of the stomach and the gut. Sometimes these glands remain inflammatory throughout the course of the tumor growth; in other cases, however, they become sooner or later the seat of metastases. In a case of an extensive squamous-cell cancer at the base of the right side of the tongue, recently observed, the submaxillary lymph glands on both sides were distinctly enlarged and firm. On the left side they proved to be, on microscopic examination, only inflammatory; on the right side several of them showed small, early metastases taking origin from the lymph sinuses.

The relationship of the inflammatory changes to the tumor metastases is instructive and suggestive. It is not impossible that at least in a number of these cases, in which infection by bacteria can be reasonably excluded the constant drain of metabolic tumor products is irritating to the gland tissue, and thus, by lasting injury and upset of physiological tissue balance by inflammatory changes, predisposes the organ to metastatic growth. If this is the case it would appear to have an important bearing on the formation of metastases; for it would indicate that, under certain conditions at least, the occurrence of metastases is made possible or favored by a drain of metabolic tumor products into a tissue.

Cohnheim's theory may therefore be correct in emphasizing lack of resistance on the part of the physiological tissue and inability to dispose of these foreign cells. This weakening of the physiological tissue may, moreover, be due to the direct action of specific tumor products. This theory would naturally apply best to the explanation of those metastases which are nearest and most intimately connected with the original growth and in which a more or less constant and concentrated communication exists. Late metastases might be explained by gradual weakening of physiological resistance.

But when we come to distant, often isolated metastases and consider the frequency with which some organs are involved in certain types of tumors irrespective of their primary location it is evident that other factors must enter into their formation.

Mechanical arrest of tumor plugs through anatomical peculiarities can hardly be of paramount importance in such cases, for everyone knows how rarely the spleen is the seat of a secondary tumor. By virtue of its anatomical structure as a true filter it offers the best

mechanical arrangement for detention of tumor cells. There must, therefore, exist other reasons.

Virchow drew attention to the fact that those organs which are rarely the seat of primary tumors are the most chosen seat for secondary deposits. This, however, can hardly be generalized, and Virchow, himself, gave no explanation of the matter.

In order to arrive at a knowledge of the frequency with which certain tissues are selected in metastases an analysis of the ninety-eight cases studied in this laboratory during the last few years was made. The malignant tumors were first classified according to their ordinary histological appearance. Then their embryogenetic origin was determined, that is, from which layer of the blastoderm the growth originated. The location of the metastases was then analyzed according to the occurrence of metastases in ectodermal, mesodermal and entodermal tissue. The glands were analyzed by themselves.

		Location of metastases.			
Type of tumor.		Ectoderm.	Mesoderm.	Entoderm.	Glands.
Epitheliomata,	11	0	2	2	8
Adenocarcinomata,	29	2	16	20	16
Carcinomata,	36	5	13	30	20
Sarcomata,	7	0	6	8	10
Endotheliomata,	6	0	3	6	8
Teratomata	1	0	2	1	0

CHART I

			Location of metastases.		
Type of tumor.	Origin of tumor.	Ectoderm.	Mesoderm.	Entoderm.	Glands.
Epitheliomata	3 Ectoderm	0	1	0	2
	8 Entoderm	0	1	2	6
Adenocarcinomata	2 Ectoderm	0	5	4	3
	5 Mesoderm	1	3	2	1
	22 Entoderm	1	8	14	12
Carcinomata	3 Ectoderm	4	4	5	1
	4 Mesoderm	0	2	2	2
	29 Entoderm	1	7	23	17
Sarcomata	1 Ectoderm	0	1	0	1
	5 Mesoderm	0	5	8	9
	1 Entoterm	0	0	0	0
Endotheliomata	6 Mesothel	0	3	6	8
Teratomata	1	0	2	1	0

CHART II

It is, of course, impossible to draw from such a table definite conclusions regarding the selective property of metastases, for other factors but selective action, some of which have previously been mentioned, complicate the value of such charts. Nevertheless, some points are interesting and more or less suggestive. Thus it will be seen that of 22 adenocarcinomata which took their origin from entoderm, 14 metastases formed in entoderm, and of 29 carcinomata which were derived from entoderm, 23 formed metastases in entoderm. Furthermore, of 5 sarcomata, 5 metastases occurred in mesodermal tissue. It is true that in these sarcomata there were

also 8 metastases in entoderm organs—the liver, the lungs and the pancreas—but the metastases in these instances were apparently not selective but due to causes previously discussed. It is also not unlikely that selection is greater in growths derived from more highly differentiated entodermal glandular tissue.

Although the material analyzed is relatively small a suggestion is contained in it that embyrogenetic and biological relationship of tumor tissue to physiological tissues may influence the often strange selective metastases. In other words it would appear as if close embryogenetic affinity of tumor cells to tissues of the same derivation influence metastatic selection. It is well known that lymphosarcomata metastasize with preference in lymphadenoid or mesodermal tissues.

The conclusion is therefore reached that the localization of metastases depends upon a number of factors. Important among these are:

1. The quantity of the tumor elements and the method of dissemination.

2. Effects of injurious metabolic products of tumor cells upon a tissue, causing degeneration and inflammation and thereby weakening its physiological resistance.

3. Close biogenetic (embryonic) relation of tumor cells to a tissue soil, whereby types of tumor cells derived from an embryonic layer grow more readily in the environment of organs or tissues which are derived from the same layer of the blastoderm.

Accurate determination of this last point will only be possible with a large amount of tumor material analyzed grossly and microscopically with full regard to the factors discussed above.

ISOLATION OF THE MENINGOCOCCUS FROM CASES OF SO-CALLED INFLUENZA.

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and

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Introduction. Material for the following bacteriological study was obtained from cases occurring in two epidemics of so-called influenza and from a number of scattered cases admitted to the U. S. Base Hospital No. 6, Bordeaux, France. The first epidemic spread among a forestry organization stationed in and about Mimizan in the Department of Landes. In the three camps affected,

approximately 350 cases appeared in a strength of 553; about 30 of these were complicated by bronchopneumonia and 15 died. The condition encountered presented an almost constant symptomatology with a few minor variations; headache and generally bodily pains of rather sudden onset, elevation of temperature lasting from three to ten days, relatively slow pulse-rate, considerable prostration and signs of a diffuse bronchitis. Nose-bleed was a common feature. In the fatal cases there was delirium, deep cyanosis and evidence of extensive bronchopneumonia consolidation.

Cases in the second epidemic investigated presented a similar clinical picture. At this time the disease was still apparently in its "pure" form, not confounded by the great variety of respiratory infections encountered among troops in France during the fall and winter months. Diagnosis was therefore relatively simple and the selection of cases suitable for study presented no special difficulties. This epidemic occurred during September and the first fortnight of October, 1918, at Camp Hunt, Le Courneau, in the Department of Gironde. The epidemic seemed to be divided into two separate outbreaks, probably originally from different sources. The first began about August 10; there were about 800 cases, 28 pneumonia and 7 deaths. The second was imported to the Artillery Camp by the arrival of 3500 troops from Brest. In the two outbreaks 3915 cases developed requiring hospitalization, with 275 pneumonia and 65 deaths.

The scattered cases studied at Base Hospital No. 6 came from a variety of casual organizations stationed in the Base Section and from soldiers evacuated from the Zone of the Advance. These were more difficult of diagnosis and selection. The disease had lost, to a certain extent, its type, and confusion, with early lobar pneumonia, bronchitis and coryza, was hard to avoid. This may perhaps, to some extent, explain the divergent findings in this group of cases.

Technic Followed in Bacteriological Investigations. For blood cultures the best medium was found to be ascitic agar or coagulated blood media slants in flat-sided Pasteur tubes, the tubes being about one-quarter filled with dextrose infusion broth (0.4 per cent. acid).

For all other cultures a coagulated sheeps' blood medium was used, the formula for which is: Defibrinated sheeps' blood, 2 or 3 parts; dextrose infusion broth (0.2 per cent. to phenolphthalein), 1 part. The mixture is well shaken, slanted, inspissated and sterilized by fractional sterilization in an Arnold sterilizer. This medium is chocolate-colored, furnishing an excellent background for examining colonies, and partially differentiates the various micrococci. Upon it the meningococcus grows well, as rather large, round, gray, shiny, flat colonies, with smooth edges. Pneumococci and many of the streptococcus group grow as brilliant green colonies, with green discoloration of the medium. Other streptococci show a marked whitish ring around the colonies. The common hemolytic streptococcus produces no color change.

Cultures were obtained from the nasopharynx, sputum and blood of patients with influenza alone and with bronchopneumonia complicating the disease. At autopsies of cases dying of bronchopneumonia cultures were made from the hearts' blood and pneumonic areas in the lungs. (Numbers given indicate cultures from individual cases.)

The sera used for agglutination reactions with Gram-negative diplococci isolated in this investigation were Types A, B and C meningococcus serum (French classification) obtained from the Pasteur Institute and in a few cases a polyvalent Rockefeller Institute antimeningococcus serum. Each of the test sera was used in dilutions of 1 to 25 and 1 to 50. A normal horse serum control, dilution 1 to 25, was always used in each test. The bacterial suspensions were made in normal salt solution from pure cultures of Gram-negative diplococci grown on coagulated sheeps' blood medium. All agglutination reactions were macroscopic and carried out in a water-bath at 37° C.

MIMIZAN EPIDEMIC. Ten blood cultures were taken in dextrose broth. All but one showed no growth. One, taken two hours before death, gave a pure culture of meningococcus Type C. At the autopsy of this case meningococcus was not recovered from the heart's blood or lungs.

From the lungs of 4 cases out of 10 dying of bronchopneumonia meningococci were recovered at autopsy. From one case meningococci were recovered from an acute suppurative otitis media. All strains recovered agglutinated with the Rockefeller polyvalent antimeningococcus serum and not with normal horse serum. Only two of these strains isolated were typed; one was Type C and the other Type B. (All strains isolated in this epidemic except the one obtained from blood were lost.)

Protocols. No. 78, R. L. H., Sgt. 1Cl., Co. "E," 4th Btn., 20th Engrs.

Clinical Diagnosis. Influenza; bronchopneumonia.

Autopsy. Extensive bronchopneumonia of all lobes of both lungs.

Lung Cultures. Meningococci, Type C, recovered from the left upper and the left lower lobes.

No. 79, G. A. B., Co. "E," 4th Btn., 20th Engrs.

Influenza; bronchopneumonia.

Autopsy. Extensive bronchopneumonia involving all lobes of both lungs.

Lung Cultures. Meningococci, Type B, recovered from the right lung.

No. 80, C. C. C., Pvt., Co. "E," 4th Btn., 20th Engrs.

Influenza; bronchopneumonia. Blood culture in dextrose broth taken two hours before death, Type C, meningococci, in pure culture.

Autopsy. Extensive bronchopneumonia involving all lobes of both lungs.

Lung Cultures. Meningococci not recovered.

No. 81, H. N., Pvt., Co. "F," 4th Btn., 20th Engrs.

Influenza; bronchopneumonia.

Autopsy. Extensive bronchopneumonia involving all lobes of both lungs. Acute suppurative otitis media (right).

Lung Cultures. Meningococci not recovered. Culture from right middle ear. Gram-negative diplococci, agglutinated by Rockefeller Institute polyvalent antimeningococcus serum and not by normal horse serum. (Not typed, culture lost.)

A. W. W., Pvt., Co. "F," 4th Btn., 20th Engrs.

Influenza; bronchopneumonia.

Autopsy. Extensive bronchopneumonia involving all lobes of both lungs.

Lung Cultures. Gram-negative diplococci, agglutinated by Rockefeller Institute antimeningococcus serum and not by normal horse serum, recovered from right lower lobe. (Not typed, culture lost.)

C. H., Pvt., Co. "E," 4th Btn., 20th Engrs.

Influenza; bronchopneumonia.

Autopsy. Extensive bronchopneumonia, involving all lobes of both lungs.

Lung Cultures. Gram-negative diplococci, agglutinated by Rockefeller Institute polyvalent antimeningococcus serum and not by normal horse serum, recovered from right upper lobe. (Not typed, culture lost.)

Le Courneau Epidemic. *Nasopharyngeal Cultures.* Twenty-five cultures were taken. Of these 22 showed Gram-negative diplococci. From 14 of these 22 cultures Gram-negative diplococci were isolated in pure culture; 9 of these 14 strains were agglutinated by Rockefeller Institute polyvalent antimeningococcus serum and not by normal horse serum; 5 strains were not agglutinated by either serum. The type of only two of these positive strains was determined. Both were agglutinated by Type C serum and not by Types A, B or normal horse serum.

Sputum. Specimens from only 4 cases were cultured. All showed Gram-negative diplococci, and from 2 these micrococci were isolated in pure culture, both of which were agglutinated by Type C, serum and not by Types A, B or normal horse serum. In 1 case at the onset of the infection, Type C meningococcus was isolated from the nasopharynx, and at the beginning of convalescence from the sputum. This patient had influenza, with no complicating pneumonia.

Blood Cultures. The first 25 blood cultures were taken in broth and were all negative for Gram-negative diplococci. The last 15 blood cultures were taken in Pasteur tubes containing solid, slanted media as well as broth. Two or three times a day the mixture of blood and broth was shaken and run up over the solid medium slants. This was done because the meningococcus is essentially an

aërobe. Of these 15 cultures 4 showed Gram-negative diplococci. Of these 4 strains 3 agglutinated with Type C serum, not with Types A, B or normal horse serum, the fourth, as yet, will not agglutinate with any of the sera on hand. No blood cultures positive for Gram-negative micrococci were obtained except in fatal cases complicated by bronchopneumonia.

Heart's Blood. Of 24 cultures taken, 4 showed Gram-negative diplococci. Agglutination reactions were done with 3 of these strains; 1 was not agglutinated by any of the sera used, 2 agglutinated with a Type C serum, not with Types A, B or normal horse serum.

Lungs. Twenty-two cultures were taken; 12 showed Gram-negative diplococci, 5 in almost pure culture. Of these 12 strains 11 agglutinated with Type C sera, not with Types A, B or normal horse serum, and 1 did not agglutinate with any serum used.

Protocols. No. 13, R. E. B., Pvt., 5th Bty., F. A. R. R.

Influenza; bronchopneumonia.

September 27, 1918. Blood culture in dextrose broth; no growth.

September 30. Blood culture in Pasteur tube; Gram-negative diplococci in pure culture (culture lost.)

No. 14, H. E. L., Pvt., 5th Bty., F. A. R. R.

Influenza; bronchopneumonia.

September 20, 1918. Blood culture in dextrose broth; no growth.

September 22. Died.

Autopsy. Bronchopneumonia involving the whole of the right lung except the apex; left lower and part of the left upper lobes. Marked edema of the brain.

Cultures. Heart's blood: Streptococci and Type C meningococci.

Lungs: Streptococci and Type C meningococci.

No. 18, H. S., Pvt., 5th Bty., F. A. R. R.

Influenza; bronchopneumonia.

September 20, 1918. Blood culture in dextrose broth negative for meningococci.

September 22. Died.

Autopsy. Bronchopneumonia involving the right, upper, middle and left lower lobes.

Cultures. Lungs: Gram-negative diplococci recovered from the lower lobe of the left lung.

No. 21, H. B., 5th Bty, F. A. R. R.

Influenza. Blood culture in dextrose broth; negative for meningococci.

September 22, 1918. Died.

Autopsy. Beginning empyema (left.) Extensive bronchopneumonia involving all lobes of both lungs.

Cultures. Lungs: Gram-negative diplococci, not agglutinated by any antimeningococcus serum on hand, isolated from right lower and the left upper lobes.

No. 36, H. F., Cpl. Hqs. Co., F. A. R. R.

Influenza. September 21, 1918. September 25. Died.

Autopsy. Bronchopneumonia involving the right upper, middle and the lower lobes and the left lower lobe.

Cultures. Lungs: Type C meningococci.

No. 39, A. C. B., Pvt., 4th Bty., F. A. R. R.

Influenza. September 23.

September 30. Bronchopneumonia.

Blood culture in Pasteur tubes. Type C meningococci in pure culture.

October 2. Died. Cultures not obtaind at autopsy.

No. 54, E. M., Sgt., 2d Bty., F. A. R. R.

Influenza; bronchopneumonia.

September, 1918. Died.

Autopsy. Extensive bronchopneumonia involving all the lobes of both lungs.

Lung Culture. Type C meningococci recovered from the left upper lobe.

No. D. S., Pvt., 5th Bty., F. A. R. R.

Influenza; bronchopneumonia.

September 25, 1918. Died.

Autopsy. Extensive bronchopneumonia involving all the lobes of both lungs.

Cultures. Lungs: Type C meningococci recovered from the right lower and the left lower lobes.

No. 60, W. F. M., Pvt., 4th Bty., F. A. R. R.

Influenza; bronchopneumonia.

September 25, 1918. Died.

Autopsy. Beginning acute fibrinopurulent pericarditis. Empyema (left). Extensive bronchopneumonia, involving all lobes of both lungs.

Cultures. Lungs: Type C meningococci recovered from left upper lobe.

No. 73, F. W. G., Pvt., 2d Bty., F. A. R. R.

Influenza; bronchopneumonia.

September 27, 1918. Died.

Autopsy. Empyema (left.) Gelatinous exudate over the right lung. Extensive bronchopneumonia involving all the lobes of both lungs.

Cultures. Lungs: Type C meningococci in almost pure culture recovered from the right lower, left lower and right upper lobes.

No. 78, W. H. G., Pvt., 2d Bty., F. A. R. R.

Influenza; bronchopneumonia.

Autopsy. Extensive bronchopneumonia involving all lobes of both lungs.

Cultures. Lungs: Type C meningococci in almost pure culture recovered from the right lower and the left lower lobes.

No. 79, C. C. D., Pvt., 2d Bty., F. A. R. R.

Influenza; bronchopneumonia.

Autopsy. Extensive bronchopneumonia involving all the lobes of both lungs.

Cultures. Lungs: Type C meningococci recovered from the left lower lobes.

No 80, E. A. G., Pvt., 6th Bty., F. A. R. R.

Influenza; bronchopneumonia.

Autopsy. Extensive bronchopneumonia involving all lobes of both lungs.

Cultures. Lungs: Type C meningococci in almost pure culture recovered from left upper and right middle lobes.

No. 81, L. F. T., Pvt., 1st Bty., F. A. R. R.

Influenza; bronchopneumonia.

September 28, 1918. Blood cultures, Pasteur tube, Type C meningococci in pure culture.

September 29. Died.

Autopsy. Empyema (right). Extensive bronchopneumonia involving all lobes of the right lung and the lower lobe of the left lung.

Cultures. Heart's blood; Gram-negative diplococci recovered. Not agglutinated by serum on hand. Culture lost.

No. 85, J. M. B., Pvt., 5th Bty., F. A. R. R.

Influenza; bronchopneumonia.

September 28, 1918. Blood culture in Pasteur tube; Type C meningococci in pure culture.

September 30, 1918. Died.

Autopsy. Extensive bronchopneumonia involving all the lobes of both the lungs.

Cultures. Heart's blood and upper lobe of right lung; Type C meningococci recovered.

One case admitted as "influenza" after two days in hospital turned out to be epidemic cerebrospinal meningitis.

No. 93, M. C., Pvt., F. A. R. R.

Influenza.

September 30, 1918. Sick about twelve hours. Temperature, 99° F. Blood culture in Pasteur tubes; Type A meningococci in pure culture.

October 2. Meningeal symptoms.

Lumbar Puncture. Cloudy fluid showing polynuclear leukocytes and a few Gram-negative diplococci.

Culture. Type A meningococci.

Diagnosis. Epidemic cerebrospinal meningitis (Type A).

October 2. Blood culture in Pasteur tube; no growth.

Cases Studied in U. S. A. Base Hospital No. 6. The cases of influenza studied at U. S. A. Base Hospital No. 6 were from many camps and organizations, some directly from transports arriving

from the United States. At this time other respiratory infections, evidently not true influenza, began to appear among troops. Numerous blood cultures were taken in many different ways; in none were Gram-negative diplococci obtained.

In a series of fifteen autopsies on patients dying of bronchopneumonia following influenza, from the lungs of only three were meningococci isolated. These three strains isolated were all Type 9. One of these strains was obtained from a case taken from a transport arriving from the United States.

Protocols. No. 5, J. C., Cpl., 351 Supply Co., Q. M. C.

Influenza; bronchopneumonia. Off transport from United States. Influenza epidemic on board. Died.

Autopsy. Empyema (right). Acute fibrinous pericarditis. Extensive bronchopneumonia involving all the lobes of both lungs.

Cultures. Lungs: Type B meningococcus recovered.

No. 11, J. D., Pvt., 321, F. A.

Influenza; bronchopneumonia.

October 22, 1918. Died.

Autopsy. Extensive bronchopneumonia involving all the lobes of both lungs.

Cultures. Lungs: Type B meningococcus recovered.

No. 1, C. T., San. Dept., Det. 343, Infantry.

Influenza; bronchopneumonia.

October 20, 1918. Died.

Autopsy. Empyema (right). Acute purulent pericarditis. Extensive bronchopneumonia involving all lobes of both lungs.

Cultures. Lungs: Type B meningococcus recovered.

Other Types of Bacteria Encountered. In the LeCourneau epidemic eight blood Gram-negative cultures taken from patients with bronchopneumonia showed Gram-negative micrococci of the Streptococcus-pneumococcus group. In all, cultures taken from pneumonic lungs of the Streptococcus-pneumococcus group, in varying numbers, were found. Twelve out of twenty-four cultures taken from the heart's blood of cases dying of pneumonia also showed members of this group. No attempt was made to classify these Gram-positive micrococci; some were green producers, some hemolytic and a few, growing as large, mucoid, green colonies and showing a definite capsule in stained specimens, were probably either pneumococci Type 3 or Streptococcus mucosus. During the study of this epidemic three cases of epidemic cerebrospinal meningitis occurred in the camp hospital. The meningococci cultured from the spinal fluid of all these three cases were agglutinated by Type A serum, not by Type B, C or normal horse serum. From one of these cases a blood culture, positive for Type A meningococcus was obtained two days before the patient developed meningeal symptoms.

In a series of fifteen autopsies at Base Hospital No. 6, hemolytic streptococci, Streptococcus viridans, pneumococcus Type 3 and pneumococcus Type 4 were recovered from the heart's blood and lungs in the different cases. In two instances Pfeiffer's bacillus was recovered from the lungs.

During the epidemic of influenza there was a moderate number of scattered cases of epidemic cerebrospinal meningitis. Meningococci recovered from the spinal fluids of the majority of these cases were Types A and B; in only three instances were Type C meningococci recovered.

ADDENDUM. Since writing this report a small epidemic of "influenza" in "pure" form occurred in Company "G," Ammunition Train, stationed at St. Andre de Cubzac, an organization which had escaped the disease during the main epidemic. Forty cases occurred in this organization December 1 and 2. December 4, nasopharyngeal cultures were taken from 29 of these 40 cases. From 16, or 55 per cent., of the cultures taken, Gram-negative micrococci, morphologically and culturally, were isolated. All these microörganisms fermented dextrose and maltose and not saccharose. Fourteen of the sixteen strains isolated were agglutinated in dilutions of 1 to 50 and 1 to 100 at 52° C. for eighteen hours by polyvalent New York City Department of Health antimeningitis serum and not by normal horse serum in dilution of 1 to 25. Two strains could not be agglutinated by any antimeningococcus serum on hand. Of the agglutinable strains it was possible to type only two with the serum on hand. These two strains were Type B. Repeated attempts at typing the other strains were made, both at 37° C., with several different lots of sera, but with consistently negative results.

In connection with the Le Courneau epidemic a high percentage of patients in this later epidemic harboring meningococci in their throats is of interest, and by typing it was hoped possibly to throw more light on the etiology of the disease.

From the throats of three of these twenty-nine patients, Pfeiffer's bacillus was recovered.

DISCUSSION. From the above findings no definite conclusions can be drawn. The findings in the Le Courneau epidemic, taken alone, might suggest that Type C meningococcus bears an important etiological relation to the cases of disease from which it was obtained. However, study of cases in different localities where a similar or identical disease was prevalent does not bear this out, as Type B meningococcus was recovered at autopsy from the lungs of a certain number of those cases. On the other hand it can be stated that the meningococcus group of bacteria is associated in some way with certain cases of the so-called influenza which prevailed among the American Expeditionary Force in France.

The foregoing studies were made during the early autumn of

1918. It is therefore interesting to see that a somewhat similar study carried out at Southampton by Captain William Fletcher[1] yielded similar results. Captain Fletcher states that between September 25 and November 23, 1918, cultures were made after death from the lungs and heart's blood of 36 American soldiers who had died of postinfluenzal bronchopneumonia. The illness of these men arose a week or ten days before on transports crossing the Atlantic. In 11 of the 36 cases the lungs and in 3 instances the heart's blood yielded numerous colonies of Gram-negative cocci. Subcultures of these cocci from 7 cases were examined serologically. six were found to be Type II and 1 Type I meningococcus (Gordon's classification). The other four strains had been lost. In all the 11 cases, Bacillus influenzæ was present in the lungs in association with the meningococcus. In 2 instances pneumococci, in 1 streptococci and in still another streptococci and pneumococci were found. A British soldier suffering from bronchitis at about the same time yielded from his frothy and purulent sputum a Type IV meningococcus.

Comparing the results obtained in France by us and in England by Fletcher the following may be stated: Nicolle's Type B meningococcus corresponds with Gordon's Type II while Nicolle's Type C has no counterpart among Gordon's types. Hence, using Gordon's classification, the type meningococci obtained from the heart's blood and lungs of cases of influenza occurring from late September to late November, especially in the American Expeditionary Force, have been chiefly Type II.

The postinfluenzal bronchopneumonias have shown a varied bacteriological flora on culture. This flora, moreover, conforms with the large number of pathogenic bacteria, the Bacillus influenzæ possibly excepted, occurring in the upper respiratory tract. It is now known that meningococcus is a not infrequent inhabitant of the nasopharynx. Moreover, during the autumn epidemic meningitis was not infrequent among the American Expeditionary Force. Hence carriers of meningococci were also common. It is therefore probable that the occurrence of meningococci in the lungs and heart closely parallels the occurrence of streptococci and pneumococci, only that the latter are more infrequent. All are to be viewed as secondary invaders and concomitants and not primary microbic causes of influenza. But as meningococci are hardly regarded as being concerned in any manner with bronchopneumonia, it appears proper that the findings we have made should be recorded.

[1] Lancet, January 18, 1919, p. 104.

ACCOUNT OF AN EPIDEMIC OF INFLUENZA AMONG AMERICAN TROOPS IN ENGLAND.[1]

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Introduction. The great autumn pandemic of influenza made its first appearance in England with the arrival at the port of Southampton of "Transport 56" from the United States. Following this, nearly every transport that arrived in England for the next four weeks brought large numbers of men either ill with the disease or who subsequently developed it. In addition a considerable number of cases broke out among American troops permanently stationed in England. Those who were most affected were the personnel of hospitals that had received patients.

Altogether, from September 20, 1918, when the above-mentioned transport arrived until the present writing, November 14, 1918, there have been approximately 7800 cases of influenza among American troops hospitalized in Great Britain. Of these, about 5000 have been cared for in American and the balance in British hospitals. Of this total number of cases 3350 developed at sea and occurred among a total of approximately 177,000 troops landed in that period. The morbidity and mortality from influenza among troops landing in England is shown in Table I.

TABLE I.—SHOWING CASES OF INFLUENZA AND DEATHS AT SEA THEREFROM AMONG AMERICAN TROOPS ARRIVING IN ENGLAND.

Week ending.	Cases of influenza landed per 1000.	Deaths at sea per 1000.
Sept. 26, 1918	15.8	0.03
Oct. 3, 1918	36.2	3.68
10, 1918	42.9	7.05
17, 1918	25.2	3.18
24, 1918	8.6	2.60
31, 1918	2.9	0.13
Nov. 7, 1918	6.5	0.00
14, 1918	1.0	0.06

[1] The authors of this paper have all been actively engaged in some phase of handling the influenza epidemic in England, and this paper represents in part a report of their own work. In addition, they have acted in an editorial capacity and consolidated the observations made in all the American hospitals. Their sincere thanks are due to the commanding officers and professional staffs of the several hospitals for their hearty coöperation. Further, an expression of appreciation is in order for the intelligent way that the cases have been handled and studied in all the American hospitals in England. It is hoped that further papers will appear, giving, in greater detail, the experience of various clinics.

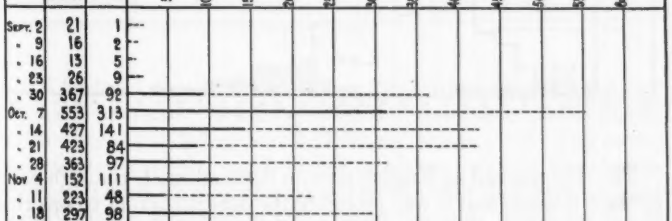
In other words, of 177,000 troops landed in the period September 20 to November 14, 1918, 19 per thousand were ill with influenza on arrival and 394, or 2.2 per thousand, died *en route*. The above table also indicates that the importation of influenza had ceased at the present writing. In addition to the imported cases a certain number developed among a fixed American military population of about 28,000. Subtracting those that were ill on arrival from the total we have 4450 developing in England among a combined permanent and transient military population of 205,000. This makes the observed morbidity of influenza 10 per thousand per month for the period September 20 to November 14, 1918. The actual morbidity is undoubtedly higher, for cases probably developed in the transient troops during the period but after their departure from England. Of these latter cases the writers have no information. There was a total of 900 deaths in England during the period, or a mortality of 2 per thousand per month. Of the total cases of influenza, both on land and sea, 16.5 per cent. died during the period.

The influenzal process was frequently complicated by bronchopneumonia, and this complication, except in rare instances, was the cause of death. Of the total cases of influenza hospitalized, about 2300, or 29.5 per cent., developed pneumonia, and of these 900, or 39 per cent., died. When the cases dying at sea are included the percentage of pneumonia cases dying becomes 60 per cent. Assuming the average length of voyage to be about two weeks, it will be seen that the mortality at sea is about double that on land.

There has not been sufficient clerical force available to show the admission to hospitals of cases of influenza by weeks, but Chart I, which shows the total of cases of pneumonia hospitalized in England by weeks and the deaths therefrom, will give a good idea of the progress and severity of the epidemic. (See Chart I.)

CHART Nº I.- SHOWING NUMBER OF CASES OF PNEUMONIA AND DEATHS THEREFROM, AMERICAN TROOPS, ENGLAND. SEPTEMBER 1ST TO DECEMBER 1ST 1918.

DATE	Nº CASES	Nº DEATHS
SEPT. 2	21	1
" 9	16	2
" 16	13	5
" 23	26	9
" 30	367	92
OCT. 7	553	313
" 14	427	141
" 21	423	84
" 28	363	97
NOV 4	152	111
" 11	223	48
" 18	297	98
" 25	168	146
TOTAL	3049	1147



SOLID LINES REPRESENT DEATHS
DOTTED " " CASES

CHART I

EPIDEMIOLOGY. It has not been possible to make detailed statistical studies of all the individual ship epidemics nor of the incidence among permanent personnel as a whole. Such studies, however, have been made in a few instances, and will, by way of illustration, give an excellent idea of the various aspects of the outbreak.

EPIDEMIC OF "TRANSPORT 56." This epidemic, which is one of the most severe of the group, has been studied in great detail, and since it can be followed from start to finish, forms an excellent illustration.

The transport left an American port on September 14 with 5951 troops on board. When two days from port a medical inspection of the entire personnel showed 7 cases of measles, 1 of which developed bronchopneumonia and died on September 21. During the voyage there developed 14 cases of mumps, 16 of measles, 4 of scarlet fever, 3 of pneumonia and a number of cases of acute respiratory tract infection (influenza). The latter rapidly assumed epidemic proportions, as will be seen in Chart II, which shows the daily incidence of such cases both during the voyage and among the troops after debarkation. (See Chart II.)

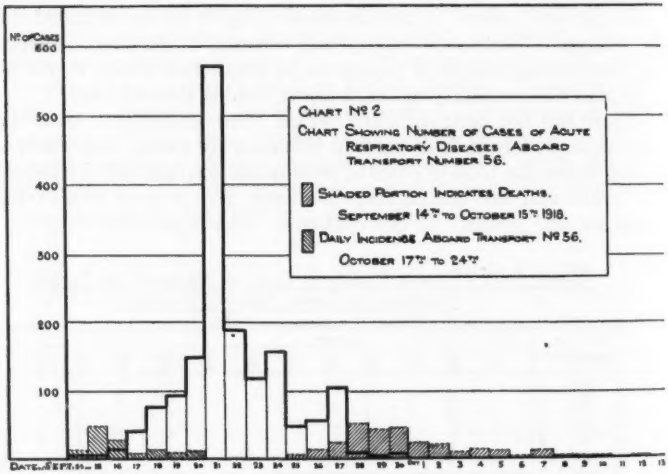


CHART II

The ship reached an English port on September 21, the high point of the epidemic, and it was probably the debarkation of troops that prevented the further spread of the disease.

The ship's sanitary report shows that early in the voyage sanitary conditions on board were satisfactory, but that on September 21, when the great incidence occurred, great difficulty was experienced

in properly caring for the patients, and the general sanitary condition became bad.

Owing to transportation difficulties it required several days to get all the sick off the vessel, and they were not all clear of her until September 25. The troops not ill were sent to an American rest camp in the vicinity. During the period from September 23 to September 27 many cases developed in this camp, which appear in Chart II, but by October 1 the epidemic had practically ceased. The conditions in the rest camp were better than on board ship, but even then there was much overcrowding, the camp containing 29 per cent. above its normal capacity. (See Chart III.)

CHART Nº 3
CHART SHOWING DISTRIBUTION OF ACUTE RESPIRATORY DISEASES AMONG PASSENGERS ABOARD TRANSPORT Nº 56. SEPT 14TH - OCT 15TH 1918.

ORGAN		Nº IN ORGANIZATION	PER CENT ILL (10 / 20 / 30 / 40 / 50)	% ILL BEFORE LEAVING BOAT	% ILL AFTER LEAVING BOAT
332 M.G	A	182	6·5	2·6	3·9
	B	"	4·4	1·1	3·3
	C	"	6·5	2·2	4·3
	D	"	7·2	3·4	3·8
	HQ	25	8·0	0·0	8·0
333 M.G	A	183	15·0	7·65	7·75
	B	"	13·0	7·1	6·5
	C	"	18·1	9·8	8·3
	D	"	3·8	0·0	3·6
	HQ	25	32·0	24·0	8·0
343 INF	A	218	31·6	17·3	14·0
	B	"	25·7	16·9	8·8
	C	"	22·5	16·9	5·6
	D	"	31·6	21·1	11·5
	I	"	49·1	41·3	6·8
	K	"	36·2	26·1	10·1
	L	"	34·0	29·6	4·4
	M	"	32·5	29·7	2·8
	SAN	35	12·0	7·6	4·4
	MG	218	13·6	7·3	6·3
S.A.R.D CAMP GORDON	15	240	15·7	4·2	11·5
	16	"	34·2	19·5	14·7
	17	"	35·4	25·8	9·6
	18	"	27·5	9·2	18·3
	19	"	25·4	12·9	12·5
	20	"	38·3	19·2	19·1
	21	"	10·2	6·7	3·5
32ND MET.		56	10·8	5·4	5·4
SIG. CORPS		36	44·5	5·4	39·1
NURSE	A	101	30·7	6·9	23·8
"	D	100	38·0	5·0	33·0
"	BH.58	101	44·5	0·9	43·6
PSYº	1	5	20·0	—	20·0

CHART III

In Chart III the incidence among the various organizations on board will be found. It will be noted that some units had a greater number become ill before leaving the ship, others after. The nurses in particular showed a much higher incidence on shore than before landing. This is easily explained by the fact that they were assigned to duty on the ship and in the various hospitals caring for the ill soldiers.

Chart IV was prepared in order to determine how many cases developed after arrival in hospital. It will be seen that 317 cases,

or 74.3 per cent., of the total had already developed before the cases were hospitalized. A few cases developed during the first and second days after admission, and in one hospital there was a considerable outbreak twelve to thirteen days later. (See Chart IV.)

Chart No. 4 Date of Onset of Pneumonia after Admission to Hospital

Hospital	No. Cases	No. Pneu.	No. Pneu. on Admission	Day on which Pneumonia Developed after Admission 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
U.S. Base 33	474	134	118	11	4	1															
Red Cross 21	389	141	135		1	1	1														
U.S. Base 204	271	109	45	4	1		5	1	1	1		2	1	3	17	16		1			1
U.S. Base 40	124	13	7	1			1		1		1	1					1				
U.S. Base 37	162	47	19	5	6	5	6		1	4								3			
U.S. Base 29	60	23	14	2	2	2					2	1									
Shirley (British)	84	22	20	2																	
University War (British)	44	39	39																		
Camp 35	60	6	—	2			1	2		1											

Chart IV

In one hospital, which was located 180 miles from the port of debarkation, 96 per cent. of the cases admitted already had pneumonia on arrival, while in another hospital, distant only eight miles, only 41.5 per cent. had pneumonia on arrival.

The uniformly high death-rate of the pneumonia is shown in Chart V, which gives the percentage dying in each hospital. It may be said that in the two British hospitals listed therein, where the mortality was very high, the cases were practically moribund on admission, and at C.H. 35 there were post-measles pneumonia. In general, however, the severity of the disease seemed to bear some direct relation to the distance the patients were transported. (See Chart V.)

In order to gain some idea about the general condition of the troops, information was obtained of the size of their home towns. This data is shown in Chart VI. It appears that two-thirds of the patients came from towns having a population under 6000. As to the State from which they came it was found that about one-quarter were from Wisconsin and a considerable proportion were from Minnesota and Illinois. A study of their pre-war occupations disclosed the fact that about 58 per cent. were from farms. (See Chart VI.)

It is interesting to note the length of time that these patients had been in the service. In Chart VII it will be seen that 41 per cent. began their military training in July, 23 per cent. in June and 10

per cent. in May, 1918. They were therefore for the most part not hardened to the conditions of warfare, and hence were particularly susceptible to a virulent infection. (See Chart VII.)

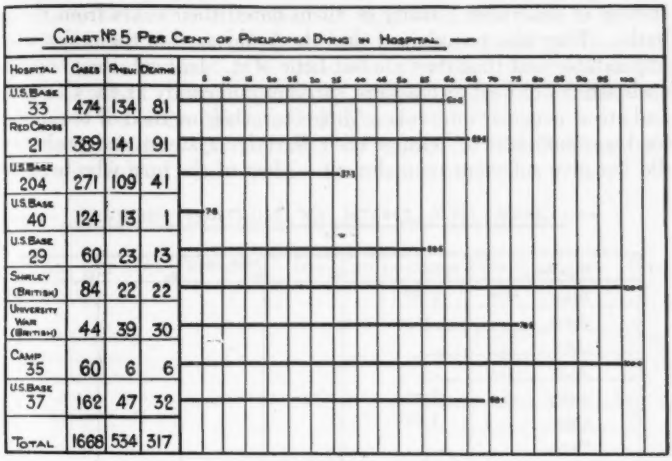


Chart № 5 Per Cent of Pneumonia Dying in Hospital
Hospital
Cases
Pneu.
Deaths
U.S. Base 33 474 134 81
Red Cross 21 389 141 91
U.S. Base 204 271 109 41
U.S. Base 40 124 13 1
U.S. Base 29 60 23 13
Shirley (British) 84 22 22
University War (British) 44 39 30
Camp 35 60 6 6
U.S. Base 37 162 47 32
Total 1668 534 317

Chart V

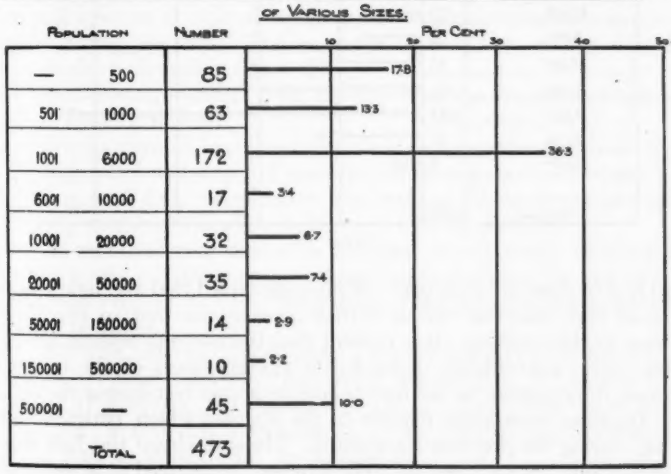


Chart VI

Information was asked from many concerning the details of their journey. Considerable evidence of debilitating conditions was

obtained. For instance, practically all complained that the shower bath which they had once or twice during the voyage was a severe ordeal. They said they were obliged to remain undressed, without covering, for a considerable period and then passed through a shower of sea-water. Many of them dated their colds from these baths. They also complained that the food issued in the ration was unpalatable and that they ate but little of it. Instead, they bought such articles of food as crackers, sardines and candy at the Canteen and ate at irregular intervals. Altogether, their method of obtaining food was sufficient to derange their digestive systems and probably did not give sufficient nourishment. Most of the men who became

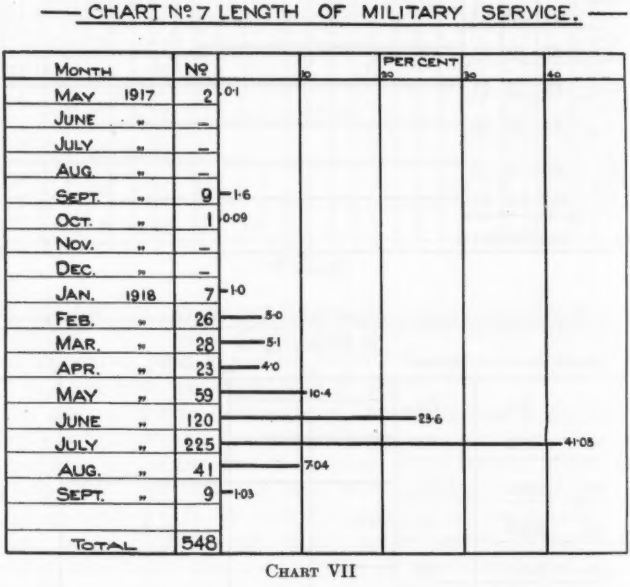


CHART VII

ill had to sleep in hammocks. They complained that the lights were on all night and that the air in their quarters was foul, so that they were unable to sleep. It is evident that the nervous tension, which was quite unavoidable, owing to the circumstances of the voyage, made it impossible for the men to receive proper rest during the trip.

Inquiries were made relative to the illnesses which patients had had during the previous six months. These disclosed the fact that only about 126 had been ill. The illnesses complained of in order of their frequency were measles, gastric disturbances, rheumatism, malaria, mumps, pneumonia and influenza. The number giving a past history of pneumonia within six months was eight and of influenza seven.

To sum up, "Transport 56" arrived at a British port with 5951 troops. It left the United States on September 14 and arrived on September 21. On the day of arrival 574 cases of influenza developed. By October 15, 1668 cases had developed, which is about 28 per cent. of the total number of troops. Of those who thus became ill, 534, or 32 per cent., were complicated by pneumonia, and of these 317, or 19 per cent., died. Of those who developed pneumonia, 59.3 per cent. died. These figures are strikingly like those previously given for the entire epidemic in England.

The morbidity and mortality by weeks for this epidemic are shown in Table II.

TABLE II.—INCIDENCE AND DEATH.

Rate per 1000 per month from influenza. Transport 56. First epidemic.

Week ending	Morbidity.	Mortality.
September 20	264	...
September 27	836	30
October 4	16	140
October 11	...	17

In marked contrast to this experience is the next voyage of the same transport. She again left the United States on October 17 and arrived in England on October 24, with scarcely more than a normal amount of sick, although a mild epidemic had been in progress during the trip. The incidence of influenza on the second trip is also indicated in Chart II.

The following extracts from the report of the transport surgeon are of extreme interest:

"Troops were all examined and their temperatures taken before the ship sailed and over 167 cases of influenza removed to shore.

"A general daily examination was made of all the troops and an evening temperature taken of the units by a medical officer.

"All on board were treated as contacts. Gauze masks were worn by all troops and the nose and throat sprayed with iodin and albolene solution, 1 gr. to 1 oz., twice daily. The last spraying was done before bedtime.

"The first day out of port, from 4 P.M., October 17 to October 18, 7 A.M., 11 new cases were reported. Second day to October 19, 7 A.M., 47; third day to October 20, 7 A.M., 17; fourth day to October 21, 7 A.M., 8; fifth day to October 22, 7 A.M., 14; sixth day to October 23, 7 A.M., 9; seventh day to October 24, 7 A.M., 11. These cases include 11 not of influenzal origin.

"Fifteen cases of pneumonia developed.

"Conclusion. These precautions seem to control an undoubted epidemic."

This epidemic of 117 cases among 5430 troops, with 15 cases of pneumonia and no deaths at sea, showed an incidence of 86 per 1000 per month, and 13 per cent. of the total cases of influenza developed pneumonia. It is further noteworthy that no increase in the epidemic occurred after debarkation.

From the second voyage of "Transport 56" it might be concluded that the measures taken—namely, masking of all souls on board, spraying daily and segregation of those with fever—prevented a widespread epidemic. This conclusion is not justified, however, because it happened that at about the same time another transport, the "Anchises," from the same port of embarkation, and loaded with troops from the same camp in the United States arrived at a British port with no cases of influenza, despite the fact that the only precautions taken were daily observation of the temperatures and segregation of those with fever. Further examination disclosed the fact that the troops on both these ships had passed through an epidemic before sailing and were therefore made up of those who had resisted this infection.

Epidemic of "Convoy 46." The first trip of "Transport 56" shows what happened on a fast ship. The following brief account of what occurred on a slower vessel is also worthy of note: Steamship "Nestor" left New York on September 17 with 2807 troops on board. No illness appeared until two days out, at which time several cases of influenza appeared in one hold. The ship put in at Sydney, N. S., on September 20, and Colonel Spitska, the S. M. O., insisted that all sick, together with contacts, be landed. This was done and somewhat over 600 men were put ashore.

The ship then proceeded on her voyage, and *en route* somewhere in the vicinity of 60 per cent. of all those on board developed influenza. Many of these had recovered by the time she reached port on October 2. There were 21 deaths at sea, or 9.5 per thousand, about 19 per thousand per month. The incidence of influenza was somewhere in the neighborhood of 1200 per thousand per month. The sanitary conditions on board the transport were bad. She was overcrowded and the ventilation was poor.

These two ship epidemics present the two extremes found. In one instance a fast ship with the epidemic breaking out toward the end of the voyage and checked by debarkation, in the other a slow ship with an epidemic raging for two weeks and on the decline when she reached port. Other ships presented similar or intermediate pictures. The epidemic in this case suggests what a very serious state of affairs might have occurred in "Transport 56" had not the troops been promptly debarked.

Epidemic at Base Hospital 29. As an example of how fixed personnel occasionally became involved a brief statement of an epidemic occurring among the personnel of Base Hospital 29 may be of interest. This hospital received a convoy of 60 cases of influenza

from "Transport 56" on September 24. Table III shows the incidence of influenza and the death-rate among the hospital personnel following the receipt of the convoy.

TABLE III.—SHOWING INCIDENCE INFLUENZA AND DEATH-RATE PER 1000 PER MONTH. PERSONNEL OF BASE HOSPITAL 29.

Week ending	Morbidity.	Mortality.
September 28	80	0
October 4	180	0
11	220	0
18	500	48
25	180	36
November 2	100	12

Other hospital personnels were affected, but not as seriously. The high incidence in Base Hospital 29 can be explained very likely by the fact that it is situated in a crowded portion of London where influenza was quite prevalent among the local population. Also, perhaps, partly because this organization, having fairly recently come from a high dry climate in the States, may have been less acclimatized to the damp weather prevalent in England than were other organizations.

Clinical Features of Disease. To get an accurate description of the clinical features of the disease under discussion an attempt has been made to collect and consolidate the observations of the medical officers in charge of the cases in all of the American hospitals in England. From the reports received and from the observations of officers visiting the several hospitals in turn it becomes apparent that we are dealing with a definite clinical entity, presenting essentially similar features in cases derived from different sources and localities.

The patients were largely received from incoming transports from America, though a certain number developed among the medical and nursing personnel and patients in hospitals for other conditions, apparently as a result of direct contact. The state of advancement of the disease varied somewhat among the groups received from various ships. Thus in the case of the rapid "Transport 56," the epidemic had only assumed alarming proportions on the day of arrival in port, so that many cases developed, and practically all the deaths occurred on shore.

With the slower ships, such as the "Nestor," taking from fourteen to fifteen days, on the other hand, the epidemic had often apparently involved the greater portion of the susceptible persons on board, and many of the patients received by the hospitals after the ship's arrival were in the most serious stages of the disease.

Histories were not always obtainable, but in general the stories told and the onset observed in the cases that developed under observation present a similar picture.

ONSET. The onset is, as a rule, sudden, with fever, chilly sensations or rigors and oftentimes a marked degree of prostration. Aching in the extremities and back and chest were often complained of, and headaches occurred in a considerable proportion. Muscle tenderness was frequent. Previously to this sudden onset many of the patients had been quite well. This applies particularly to the cases that developed in England, but in many of those that developed on board ship there were histories of common colds, sea sickness and exhaustion for several days previously. Coughing, with a mucopurulent sputum, occurred from the start in practically all of the cases. In addition a certain number showed a definite coryza, with sneezing, not, however, with conjunctivitis as in measles. Sore-throat was occasionally present, but was not a common feature. Hoarseness may occur in the later stages, but not usually in the beginning.[2] The sputum even on the first day or two of the disease was occasionally streaked with fresh blood, and epistaxis was often seen. The pulse in such early cases was usually full and bounding, of good tension and the rate varying with the temperature from 80° to 120°.

UNCOMPLICATED INFLUENZA. All cases having started as outlined above, developed further in one of two definite ways: They either ran an uneventful course of from three to seven days, ending in recovery, or they developed a most serious type of bronchopneumonia. The former group, which we may call simple influenza, comprised from 60 to 70 per cent. of the whole. Of the course of these uncomplicated cases there is nothing of any great moment to

[2] In regard to laryngeal involvement the following report, by Captain William M. Bane, of Base Hospital No. 29, is of interest:

"Among the 235 cases of influenza and the 54 cases of pneumon a which have been cared for in this hospital from September 1, 1918, to October 25, 1918, there have occurred 9 cases of laryngitis, 6 of which developed only hoarseness and cough and 3 a complete aphonia.

"The type observed has been invariably an acute catarrhal aryngitis. The active cause is infection by invading organisms which gain entrance into the mucosa when its resistance has been lowered by one or more of the following: Irritating cough, toxins evolved from diseased nasal mucosa, accessory sinuses or pharynx; inspiration of air improperly moistened, warmed and filtered by reason of nasal obstruction. The influenzas and pneumonias almost all show inflamed and swollen mucous membranes in the nose and throat, and mouth breathing is commonly observed. Sinusitis, especially frontal, has been very common.

"Of the subjective symptoms, alterations in voice and the cough have been constant, but pain has been very uncommon. Objectively, very slight swelling and hyperemia of the cords and adjacent mucosa have been observed, but no cases in which there was any edema, hemorrhagic areas or ulcerations have been seen.

"As to prognosis it seems that the infection, although quite virulent, has attacked the upper respiratory tract much less severely than the lower part, so that the outcome from the laryngitis is usually good.

"Treatment has consisted essentially of limitation in the use of the voice, complete rest where possible and mild inhalations of tincture benzoin comp. and steam every three hours. The inhalations were not only beneficial to the mucosa of the throat but usually very soothing to the patient with severe bronchitis. Appropriate treatment to the nose, accessory sinuses and tonsils is essential. The cases with complete aphonia regained the use of the voice in about three days, followed by a prolonged period of hoarseness. Another case with aphonia proved to be hysterical."

relate. The fever continued generally from one to seven days, but usually from two to four days, and then fell either by crisis or rapid lysis to normal. With the fall in temperature the toxic symptoms cleared, if they had not previously, and oftentimes the patients would feel entirely recovered. In many cases a considerable degree of prostration persisted for several days. The cough usually persisted for a week or more and the patients continued to raise a small amount of purulent sputum after they were, in other respects, quite well. During the fever there was nearly always a considerable degree of anorexia and often profuse sweating. Abnormal signs in the chest in the cases of simple influenza were often entirely lacking, or in a certain number there might be a few scattered rales and ronchi. The patients were usually flushed and occasionally slightly dusky in appearance. The eyelids often were slightly puffy. Sometimes transient erythemas were noted over the trunk or extremities, but there was no characteristic exanthem or enanthem. To sum up: the picture was that of an acute infection of the upper respiratory tract, with very sudden onset and marked toxemia, and because of its epidemic form, evidently highly contagious.

Influenza Pneumonia. We come now to the second type of the disease, which in reality seems to constitute what might be termed a superimposed epidemic and which took the form of an exceedingly fatal type of bronchopneumonia closely associated with a purulent bronchitis, and which is responsible for practically all the deaths occurring in the epidemic. This bronchopneumonia, though most probably caused by a different infectious agent from the original disease, bears a close relationship to the latter, inasmuch as it presents some very characteristic features which differentiate it from ordinary pneumonia, and because, so far as we can learn, it never appears out of a clear sky in a healthy individual but only in persons already suffering from influenza.

The pneumonia may begin anywhere in the course of the simple influenza, sometimes as early as the second day. It is ushered in by an apparent increase in the toxicity of the patient, by an increase in the rate of respiration and the early development of cyanosis. The physical signs of consolidation appear usually at one or both bases, though occasionally consolidation has first been noted in one of the upper lobes. At the same time there is generally found an increase in the amount of moisture in the chest, as shown by the presence of numerous moist rales scattered throughout. The sputum becomes more purulent and contains considerable quantities of fresh blood. Epistaxis also was exceedingly frequent. The course may be exceedingly fulminating, death occurring as early as the second or third day. In such cases the signs of consolidation rapidly extend, one lobe being involved after another in an almost explosive fashion, so that death may occur from mechanical asphyxia so great is the lung involvement. Other cases run a more prolonged course.

Patients may continue with the disease for two weeks and ultimately succumb. In such the consolidation is liable not to be particularly extensive, but the purulent bronchitis is a more prominent feature and the cause of death apparently is toxemia. Between these two types all grades of intermediate varieties were found. The temperature curve in the fulminating cases was apt to be continued high anywhere from 102° to 105°, the pulse varying from 100 to 130. Shortly before death the temperature would rapidly drop and the pulse rapidly rise. In the more chronic cases the temperature was liable to be very irregular, a septic temperature in fact. The cases that recovered usually showed a gradual lysis, though the crisis was occasionally observed. A pseudocrisis, followed by a resumption of fever of the irregular type, was more frequent. The respiration was nearly always increased in rate, and often shortly before death exceedingly rapid, sometimes as high as sixty per minute. It was apparently a tachypnea rather than a true dyspnea, however, for except in the moribund cases it was usually not a source of discomfort to the patient. Certain very striking differences between the influenza pneumonia and ordinary lobar pneumonia have impressed themselves upon practically all the officers who have had patients in their charge. In the first place the general appearance of the patient is unlike the usual pneumonia. In spite of his rapid breathing there is a striking absence of orthopnea; in fact, he usually lies flat by preference. There is almost never any pleural pain, and although an occasional friction rub has been heard it is exceptional. The painful grunting breathing of lobar pneumonia is almost invariably absent. The tenacious, tawny or rusty sputum of true pneumonia is not seen, but instead an abundant mucopurulent sputum, with considerable fresh, bright red blood is the rule. Another characteristic feature is the early developing and profound cyanosis seen in all the severer cases. It is of a peculiar tint, a deep lavender or heliotrope. As a rule the intensity of this cyanosis bears no definite relationship to the degree of consolidation. It may be as deep in the primarily purulent bronchitis cases in which there is little consolidation as in the fulminating cases with extensive consolidation. Moreover, no cause for it can be discovered in the circulation. No dilatation of the right heart can be made out on physical examination, and this is in part borne out by the autopsy findings; nor is the pulse necessarily of poor quality nor the blood-pressure low. A recent paper by Hoover[3] is extremely interesting in this connection, and his views on the importance of foam in the bronchial tree may explain the non-relationship of cyanosis and degree of consolidation seen in these cases. As Hoover points out the presence of foam in the bronchial tree will cause a marked

[3] Moisture in the Air Spaces of the Lungs and Oxygen Therapy, Jour. Am. Med. Assn., September 14, 1918, lxxi, 880.

hindrance to gas exchange in the lungs, and as most of these cases of influenza pneumonia have considerable moisture in the chest, their cyanosis may well be explained on that basis.

It should also be emphasized that epistaxis is frequent and highly characteristic of the disease.

Certain other noteworthy manifestations and complications have been observed. A moderate number of cases presented the signs of meningismus, and these were relieved by lumbar puncture, the fluid being sterile, but under pressure. Another striking occurrence was the development, in a few cases, nearly every hospital had one or two, of a subcutaneous emphysema of the neck and upper chest. This was unquestionably of mechanical origin, for it was never accompanied by any inflammatory process. It was as though air had been introduced beneath the skin and was unaccompanied by any redness or induration. The cause of this phenomenon has not been definitely established, but in one case that came to autopsy the emphysema was found to extend downward along the course of the trachea through the mediastinum and about the pericardium. Moreover, several cases at autopsy which had not presented emphysema of the neck during life showed emphysema in the mediastinum and about the pericardium, and one showed blebs of air over the visceral pleura. It seemed most likely that the air escaped into the lung, and following the course of the large bronchi made its way through the lung root and along the course of the trachea to the neck. In no instance was this condition associated with pneumothorax, nor was any case found at autopsy in which there might have been an escape of air from the lung through adhesions to the mediastinum. Rupture of the trachea or main bronchi was not found.

An occurrence which may or may not be accidental was the development in some of the cases, which had either had or were having influenza pneumonia, of meningococcus meningitis. This occurred in at least 30 cases, 20 of them being in one hospital. This uneven distribution suggests that the incidence of cerebrospinal fever was not causally related to the influenza, except in so far as the influenza might have been predisposing. Three cases of pneumococcus meningitis were reported.

Evidence of disease of the accessory sinuses of the nose was frequently found, as was also purulent otitis media. It is interesting to note in this connection that out of 26 autopsies in which the head was explored, empyema of one or more of the accessory sinuses was found in 21.

One case of undoubted acute endocarditis was found clinically and two at autopsy. Systolic murmurs at the apex were not infrequent, and in the cases that recovered, rapidly disappeared. Pericardial friction rubs have not been reported.

Abdominal complications beyond the distention often seen in pneumonia were lacking. Enlargement of the spleen demonstrable

on physical examination was rare. A few cases presented nausea and vomiting and acute abdominal pain.

Jaundice occurred in a small percentage of the cases.

An exceedingly interesting complication was observed at American Red Cross Hospital 4. Fifteen cases presented swollen, painful feet, and several of these showed acute red inflammatory areas over the toes and instep from 1 to 2 cm. in diameter. Two cases also showed blebs and bullæ over the shins. It was thought that there might have been septic thrombosis or embolism, the red areas being similar to those described by Osler in malignant endocarditis.

A negative feature of the epidemic, which is rather striking, is the comparatively low incidence of empyema.

CLINICAL PATHOLOGY. *Sputum.* The gross appearance of the sputum has already been described. The points to be emphasized in the pneumonia cases are its abundance and its striking difference from ordinary pneumonic sputum, in that in place of a tenacious rusty sputum there is found a yellow purulent sputum with abundant streaks of fresh blood.

Films of the sputum show usually a varied flora. Influenza-like bacilli were frequently found but so, too, were a variety of other organisms, having, for example, the morphology of pneumococcus or streptococcus.

Blood. Blood counts were not done systematically, but when done were of considerable interest. In the simple influenza the white count was usually low, 5000 cells per cm. being not uncommon. The pneumonia cases also often showed a leukopenia, sometimes a slight leukocytosis, rarely over 12,000 to 14,000, and practically never over 20,000. The fatal cases usually showed a leukopenia. This is in very striking contrast to ordinary pneumonia.

Urine. The urine showed the ordinary type of febrile urine, a moderate amount of albumin and tube casts being present particularly in the pneumonia cases. Blood was rarely seen.

TREATMENT. The preventive measures taken were entirely along the lines of isolation and hygiene, and are dealt with under the heading Hospitalization.

No specific therapy was employed except in one instance, and since the causative organisms were not definitely known, no specific therapy could be used except in an entirely empirical way. At the beginning of the outbreak it was thought that the pneumonia was very likely due to the streptococcus, and therefore a sensitized streptococcus vaccine obtained through the kindness of Lieut.-Col. Harvey, R.A.M.C., from the vaccine laboratory, was tried in a small series of cases, without, however, any apparent benefit to the patient.

Oxygen has been used fairly extensively without any very striking results. The patients might or might not improve temporarily, but the course of the disease does not usually seem to be materially altered. At one hospital the Haldane field apparatus for oxygen

administration was used. It was found to be a convenient way of giving oxygen, but beyond that no extraordinary beneficial effect was noted.

Further than this the usual symptomatic treatment of pneumonia has been carried out. Digitalis in some form has been commonly employed as well as camphor and other stimulants, and morphin or opium where indicated. At some of the hospitals urotropin has been used as routine.

Fluids have been forced by mouth, rectally and subpectorally.

It is felt that the hope lies in prophylaxis. Should the etiological factor be proved it should be possible to immunize against this disease. The immunity thus secured plus better methods of sanitation, particularly on board transports, should prevent a recurrence of the epidemic.

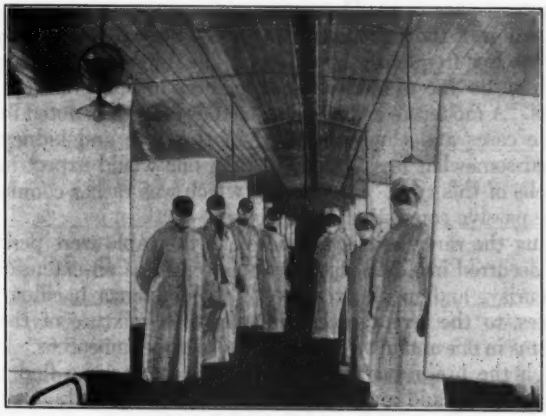


FIG. 1.—Showing methods of isolation ward in Base Hospital 29, Tottenham, England

HOSPITALIZATION. The matter of proper hospitalization of this sudden influx of contagious cases presented certain difficulties, but in general it was accomplished with all possible promptness, and except for the fact that in certain instances patients had to be transported for comparatively long distances on ambulance trains to reach hospitals, which is unquestionably undesirable, it is not thought that any cases suffered for want of proper hospital care.

In hospital, strict isolation was carried out from the start. Not only were the influenza cases and pneumonia cases segregated in separate wards, but in all the American hospitals they were screened one from another. The most usual method of screening was by means of sheets hung from wires. Fig. 1 shows this method in practice in a ward at Base Hospital 29.

Since the pneumonia may be due to a number of different infecting organisms, we believe that the importance of the prevention of cross infection by droplet infection by the use of screens cannot be too strongly emphasized.

In addition to these measures all personnel while on duty in the wards constantly wore gauze masks over the mouth and nose and were obliged to douche their nasal and oral cavities with some mild antiseptic solution once daily.

PATHOLOGICAL ANATOMY.[4] A summary of the anatomical diagnoses recorded are shown in Table IV. Pneumonia was found in 99 per cent. of the fatal cases, and in 80 per cent. was apparently bronchial in distribution. The most common complication was fibrinous pleurisy, 39 per cent. Pleural effusions and empyemas were not uncommon, but were much less frequent than in the epidemics of streptococcus pneumonia occurring in the United States last winter. (See Table IV.)

Dilatation of the right heart was noted very frequently by some observers, less frequently by others. The difference in percentages noted may be due to individual differences in interpretation of the findings. A moderate enlargement of the spleen was noted in about half the cases and cloudy swelling of the liver and kidneys were recorded somewhat less frequently than one would expect in acute infections of this type. One finding which was rather common was chronic passive congestion of the liver.

Among the rarer lesions not noted in the table were peritonitis, which occurred in a few instances apparently as an extension from the pleurisy, and meningitis due to the influenza bacillus in two instances, to the streptococcus in one, to a mixture of these two organisms in one and in two instances to the pneumococcus. In cases in which the brain was examined it was common to find the pia distended with fluid and the cortex intensely injected. One might include under the complications the cases of meningococcus meningitis which followed bronchopneumonia, as both these meningitides and the pneumonias were probably sequelæ to the original grip infection.

[4] The observations on the pathology and bacteriology of this epidemic are compiled from data and material contributed by workers at the various laboratories in this base section:

Major W. W. Williams, Base Hospital No. 29.
Captain A. W. Stahl, Base Hospital No. 204.
Captain G. A. Sorgats, Camp Hospital No. 40.
Captain M. B. Beecroft, Base Hospital No. 37.
Lieut. R. S. Stauffer, Base Laboratory.
Lieut. R. R. Simmons, Base Hospital No. 33.
Lieut. F. B. Harrington, Camp Hospital No. 35.
Lieut. T. M. Marks, Base Hospital No. 40.
Lieut. D. C. Lee, A. R. C. M. Hospital No. 4.
Lieut. E. D. McBride, A. R. C. M. No. 21.

TABLE IV.—SUMMARY OF AUTOPSIES.

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	B. H. No. 204.	B. H. No. 40.	B. H. No. 37.	Base Lab. (B. H. No. 35).	C. H. No. 40.	A. R. C. No. 4.	B. H. No. 29.	A. R. C. No. 21.	B. H. No. 33.	Total.	Per cent.
Total autopsies	53	2	25	25	21	127	19	21	101	394	
Lungs:											
Bronchitis	32	2	17	0	0	30	7	21	101	210	53.3
Bronchopneumonia	52	2	17	21	19	126	19	6	52	314	79.7
Lobar pneumonia	1	0	7	4	2	0	0	12	49	75	19.0
Abscess of lung	0	0	2	2	1	10	0	0	5	20	5.1
Gangrene of lung	0	0	0	0	0	0	0	0	0	0	0
Infarcts of lung	0	0	0	2	0	0	1	0	0	3	0.8
Pleuræ:											
Fibrinous pleurisy	16	0	13	19	11	59	4	2	29	153	38.9
Pleural effusion ser. Slight	12	0	1	10	1	10	4	5	24	67	17.07
Pleural effusion ser. Moderate	15	1	2	1	5	8	3	2	4	41	10.4
Pleural effusion ser. Marked	10	0	2	0	6	4	4	1	3	30	7.6
Pleural effusion pur. Slight	1	0	0	0	0	3	0	0	6	10	2.5
Pleural effusion pur. Moderate	5	0	0	1	4	6	1	1	5	23	5.8
Pleural effusion pur. Marked	1	1	2	4	0	5	1	0	3	17	4.3
Pleural adhesion	23	1	12	15	11	13	5	6	24	110	27.9
Pneumothorax	0	0	0	0	0	5	0	0	0	5	1.27
Pericardium:											
Fibrinous pericarditis	2	0	1	3	3	5	2	0	3	19	1.81
Serous pericarditis	40	2	1	10	14	17	9	7	8	108	27.4
Purulent pericarditis	1	0	0	3	1	3	0	0	0	8	2.0
Heart:											
Dilatation, right side	3	1	17	11	8	53	7	8	0	108	27.4
Dilatation, left side	0	0	0	1	8	0	1	2	0	12	3.0
Myocarditis, acute	0	0	0	0	0	0	0	0	0	0	0
Endocarditis, acute	1	1	0	0	0	0	0	0	1	3	0.8
Liver:											
Perihepatitis, acute	0	0	0	0	3	1	1	0	0	5	1.3
Parenchymal changes	1	0	12	8	2	88	2	0	2	115	29.2
Spleen:											
Perisplenitis, acute	0	0	0	0	9	1	0	0	0	10	2.5
Enlarged soft spleen	15	2	15	12	8	95	3	4	18	172	43.6
Other parenchymal changes	0	0	0	1	0	0	0	0	0	1	0.25
Kidneys:											
Simple congestion	18	2	9	2	10	38	2	8	0	89	22.6
Cloudy swelling	6	0	4	19	5	42	0	0	2	78	19.8
Actual acute nephritis	0	0	2	7	5	35	0	0	0	49	12.4
Accessory nasal sinuses:											
Number of examinations	17	0	0	9	0	6	0	0	0	32	
Catarrhal sinusitis	0	0	0	0	0	5	0	0	0	5	15.6
Purulent	16	0	0	5	0	1	0	0	0	22	69.0

NASAL SINUSITIS. A lesion which interested us considerably was a purulent inflammation of the sphenoid or ethmoid sinuses. This seldom gave pronounced clinical symptoms, but was found in 69 per cent. of the cases in which the sinuses were examined post-mortem—at one hospital in 16 out of 17 cases. It was striking from the bacteriological side that the same organisms as were found in these infected sinuses, were usually present in the consolidated lung of the same case. This fact suggested that these sinuses might be the primary focus of infection, a possibility which was also suggested by Major H. E. Robertson[5] in connection with an earlier influenza epidemic.

PERIBRONCHIAL PNEUMONIA. The most important lesion apparently was the pneumonia, and this varied remarkably from case to case, both anatomically and bacteriologically. In the earlier cases the lung showed fairly uniform consolidation, approximating a typical lobar pneumonia, and differing from it chiefly in the hemorrhagic appearance of the lung and the moistness of the consolidated areas. From some of these massive pneumonias only the influenza bacillus was recovered on culture. In the later cases the consolidation was remarkably patchy, and toward the end of the epidemic cases began to appear which showed macroscopically a purulent bronchitis and practically no pneumonia. These last cases resembled strikingly those seen in an epidemic in France in December, 1917, which were uncomplicated influenza bacillus infections. Of the bronchopneumonias many showed minute abscesses, some showed extensive hemorrhages, many pronounced edema of the unconsolidated areas and in those with pleural effusions the picture was complicated by a compression atelectasis. These pneumonias were anatomically not one disease but a variety of terminal processes grafted on some original infection.

It is impossible, therefore, to describe any lesion typical of all cases. However, the majority of the lungs examined had certain common characteristics. They were, as a rule, very voluminous and contained considerable air, but firm nodules could be felt in the cushiony lung substance. Toward the posterior portion of the upper lobe and the base of the lower lobe these discrete masses were replaced by a solid block of airless lung. On section the consolidated areas stood out rather sharply, and frequently were in the form of a pyramid, with the base against the pleural surface of the lung. Scattered through them were dots and lines of opaque yellowish-gray material, frequently with points of black anthracotic pigment in the center, varying from 0.5 mm. to 3 or 4 mm. in thickness. In some cases these gray areas were firm and in others could be squeezed out as drops of thick pus. Between these foci the con-

[5] Jour. Am. Med. Assn., May 25, 1918.

solidated tissue was granular, rather moist, sometimes gray, but more frequently a brilliant crimson. Again, between these completely consolidated masses the lung tissue was often nearly solid, moist and red, apparently representing what Baehr has described as an explosive terminal extension of the pneumonia.

The arterial trunks were free, the larger bronchi and trachea intensely inflamed with bright crimson mucosa and a small amount of purulent or fibrinous exudate.

Microscopically the most interesting changes were in the smaller bronchi. These were frequently represented by a collection of leukocytes bordered on one side by the mucosa and muscular wall of the bronchus and on the other side emerging indefinitely with alveoli filled with purulent exudate. In other cases only shreds of bronchial epithelium could be made out, remaining here and there along the wall, and in many sections no remnants of the bronchial wall could be made out, the bronchi being apparently represented by little pools of pus, each lying close to an artery and a vein and bordered only by inflamed alveoli. The air cells immediately around these disintegrated bronchi were usually filled with pus, but beyond these was a zone in which the exudate was, as a rule, croupous, containing considerable fibrin, with red cells, leukocytes and epithelia in varying proportions. Not infrequently there were extensive areas of hemorrhage, in some of which the red cells lay within well-preserved alveoli and in others the lung framework had been swept away.

It has not been possible to study all the cases microscopically or to correlate all the histological pictures with the bacterial findings. It appeared, however, that the feature common to nearly all the cases was what we may call an ulcerative bronchitis and peribronchial pneumonia, the ulcerative process often resulting in a complete dissolution of the walls of the smaller bronchi. The breakdown of this line of defence would make easy the access of any pathogenic organisms in the bronchial tract to the already injured lung tissue. This offers a possible explanation of the variety of bacteria encountered not only in the lung but in the other viscera and the blood stream and also of the frequency of mixed infections.

Bacteriology. The preliminary examination of sputum from the early cases of pneumonia showed a great variety of organisms, with no striking predominance of one type, and it was thought that the surest evidence as to the identity of the infecting agent could be obtained from cultures postmortem. The results of cultures from consolidated lungs made at the various laboratories in the base section are summarized in Table V. Here, again, a great variety of bacteria were found, the organism most frequently met with being one closely resembling the influenza bacillus of Pfeiffer. (See Table V.)

TABLE V.—CULTURES FROM LUNGS POSTMORTEM.

	Base Laboratory (1st series).			Base Laboratory (2d series).			Base Hospital No. 33.			Base Hospital No. 29.			Base Hospital No. 37.			A. R. C. M. Hospital No. 4.			Camp Hospital No. 40.			Total.			
Number of cases	48 cases.			16 cases.			55 cases.			22 cases.			15 cases.			8 cases.			24 cases.			188 cases.			
	Alone.	Mixed.	Total.	Alone.	Mixed.	Total.	Alone.	Mixed.	Total.	Alone.	Mixed.	Total.	Alone.	Mixed.	Total.	Alone.	Mixed.	Total.	Alone.	Mixed.	Total.	Alone.	Mixed.	Total.	Per ct.
B. influenzæ	13	24	37	0	8	8	5	15	20	0	0	0	0	5	5	1	4	5	0	8	8	19	64	83	44
Pneumococcus	3	12	15	0	7	7	1	6	7	18	4	22	3	7	10	2	5	7	6	10	16	33	51	84	44
Streptococcus hemolyticus	1	5	6	3	4	7	24	8	32	0	4	4	3	3	6	0	1	1	8	2	10	39	27	66	35
Staphylococcus aureus[6]	3	6	9	0	6	6	..	..	..	..	..	..	0	3	3										
Streptococcus viridans[6]	0	1	1	0	4	4	3	2	5																
Meningococcus	1	1	2	0	1	1	11	1	2	..	..	..	..	..	..	..	..	..	..	..	..	2	3	5	2½

[6] Totals and percentages for Staphylococcus aureus and Streptococcus viridans are not included because these organisms were not recorded by all observers.

INFLUENZA BACILLUS. All the organisms reported as influenza bacillus gave characteristic delicate growth on subculture on blood-agar, and morphologically were minute cocco-bacilli or minute rods. In older cultures long thread-like forms and also swollen oval or pear-shaped forms were sometimes seen. A considerable number of these strains were planted in parallel on serum-agar and on whole blood-agar, and all those tested showed characteristic inability to grow on serum-agar. On account of the rush of work it was impossible to complete the identification of all strains, especially during the first part of the epidemic. Up to the present we have also not succeeded in producing a satisfactory agglutinating serum for the identification of these organisms. As far as observed, however, they correspond to the usual description of B. influenzæ.

PNEUMOCOCCI. The majority of the pneumococci isolated were tested for bile solubility and also for agglutinability in Group I, II, and III sera. At Base Hospital 29 inulin fermentations were also carried out. At this laboratory all the pneumococci recovered postmortem belonged to Group IV. At the base laboratory we obtained two strains of Group I, two strains of Group II, five strains of Group III and 19 strains of Group IV. Of those classed as Group IV several showed a slight agglutination in 1 to 20 dilution both in Group I and Group III serum and one strain agglutinated slightly in all three sera. The reactions, however, in these cases were so feeble when compared with the complete agglutination which occurred when the homologous strains were employed that these organisms were classified as Group IV. Whether many of them may belong to one subtype of this heterogeneous group has not yet been determined.

GRAM-NEGATIVE DIPLOCOCCI. In the earlier cases no record was made of the finding of Gram-negative diplococci in cultures from the lung, as they were regarded as being saprophytes from the bronchi. On account of the frequency with which they occurred, not only in cultures from the lung but also in cultures from the heart's blood or spleen, the later strains were more carefully studied. Of these one pure culture obtained from the lung agglutinated in Type I antimeningococcus serum (Gordon), and one which was found mixed with influenza agglutinated in Type II. Another one associated with the pneumococcus agglutinated with Lederles's polyvalent serum, but failed to agglutinate with any of Gordon's type sera. Of the others most strains produced pigment on subculture or else grew in a dry mass which would not emulsify and were discarded. The few which gave satisfactory emulsion were tested but were not agglutinated by any sera at our disposal. Two strains of a number submitted by Capt. W. Fletcher, R.A.M.C., failed to agglutinate in any of the "Gordon" type sera but agglutinated in Type C of the Pasteur Institute. Two cultures were also obtained by Lieut. Simmons. Of the strains mentioned below, isolated by

Lieut. Stauffer from the sputum and nasopharynx, one agglutinated in polyvalent antimeningococcus serum "Flexner" but not in any of the "Gordon" type sera. The remainder were inagglutinable. It is interesting that apparently 5 cases of meningococcus-pneumonia occurred in this series.

Cultures from other Viscera. The results of cultures from heart's blood and other viscera are summarized in Table VI. As the rountine procedure varied at different hospitals this series is far less complete. Here, again, the picture is confusing. In one case the influenza bacillus, streptococcus and pneumococcus were all isolated from the heart's blood. Another confusing factor was that Staphylococcus albus and Gram-negative diplococci of the flavus and catarrhalis types were not infrequently recovered from the heart's blood or from the spleen, which suggested that in these cases the bacterial flora of the respiratory tract gained easy access to the blood stream either shortly before or after death. One fact that seemed evident was that the pleural and pericardial effusions were due either to the pneumococcus or streptococcus and not to the influenza-bacillus. (See Table VI.)

In order to bring out more clearly these variations the reports from the various laboratories have been recorded separately in these tables and the records at the base laboratory divided into those obtained during the first part of the epidemic, and a second series, done during the later part when the cases were less numerous, and it was possible to work out the cultures more thoroughly.

Discussion of Postmortem Cultures. The striking feature of the postmortem bacteriological findings was the great variety of bacteria recovered. The findings varied first according to the period of the epidemic. During the first part of the epidemic the influenza bacillus was present in most of the cases as far as our personal observation went, and frequently was the only organism recovered from the consolidated lung. As the epidemic progressed this organism was less frequently recovered, and instances of pure influenza pneumonia were extremely rare. The findings also varied according to the portion of the lung examined. Several bacteriologists reported that in cases in which the recently involved portion of the lung gave a pure or a nearly pure culture of B. influenzæ the older areas showed pyogenic cocci alone, being mixed with a few influenza bacilli. The findings also varied very strikingly from place to place. At Base Hospital 33 over 50 per cent. of the cases showed hemolytic streptococci, while at most of the hospitals this type of infection was rare, and at Base Hospital 29, pneumococcus Group IV was recovered from every case autopsied.

The majority of the patients in this series came from one transport and became sick while they were in close contact with each other, and were later distributed to the various hospitals in the section. It seemed clear, on epidemiological grounds, that the origi-

TABLE VI.—CULTURES FROM OTHER VISCERA.

	Hearts' blood.			Spleen.			Liver.	Pleural fluid.			Pericardial fluid.				Sphenoid sinus.		
	Base Laboratory (1st series).	Base Laboratory (2d series).	Base Hospital No. 33.	Camp Hospital No. 40.	Base Laboratory (1st series).	Base Laboratory (2d series).	Camp Hospital No. 40.	Base Laboratory (1st series).	Base Laboratory (2d series).	Base Hospital No. 33.	Camp Hospital No. 40.	Base Laboratory (2d series).	A. R. C. M. Hosp. No. 4.	Camp Hospital No. 40.	Base Laboratory (1st series).	Base Laboratory (2d series).	Base Hospital No. 33.
Number of cases examined	..	17	58	26	..	17	26	17	5	6	26	5	10	26	11	5	5
Number from which growth was obtained	5	13	32	15	7	9	7	12	5	6	6	5	10	9	9	5	5
B. influenzæ	3	1	1	0	4	0	0	0	0	1	0	0	0	0	4	0	4
Pneumococcus	2	6	5	4	1	2	5	3	2	0	4	2	0	7	0	3	0
Streptococcus hemolyticus	0	6	23	3	0	4	2	5	4	5	2	3	6	2	1	2	0
Staphylococcus aureus	0	2	3	0	1	3	0	6	1	0	0	1	0	0	3	0	0
Streptococcus viridans	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0

[7] One case Staphylococcus albus only.

nal infection must have been due to one microörganism, and we can only conclude that the various infections observed postmortem were terminal affairs. The fact that certain types of infection predominated at certain hospitals suggested that the terminal infection occurred after admission to the hospital.

The only organism found which could well have been the primary infecting agent was the influenza bacillus, and this was recovered from only 44 per cent. of all the cases. This figure may well be lower than the actual fact on account of the difficulty often found in cultivating this organism when we know it to be present. Its prevalence during the early part of the epidemic and in the recently involved portions of the lung both pointed toward its being the primary agent. In order to secure more definite evidence on this point, cultures were made from blood and from sputum of patients during life.

Blood Cultures. The blood cultures gave little information. When taken from uncomplicated influenza they were uniformly negative. A small percentage of those taken from cases of pneumonia showed the presence of pneumococcus or streptococcus.

TABLE VII.

	Base Hospital No. 204.	Base Hospital No. 33.	Base Hospital No. 29.	A. R. C. Hospital No. 4.
Number of cultures . .	20	16	70	20
Pneumococcus	0	0	4(6%)	8
Streptococcus hemolyticus	0	0	2(3%)	0
Negative	20	16	64	12

Sputum Cultures. The cultures from sputum were more helpful, though by no means conclusive in their results. Thirty-two cases from "Transport 56," only 3 of which had definite signs of pneumonia, were studied by Lieut. Stauffer. The sputum was obtained at the bedside, washed and injected immediately into the peritoneum of a mouse, and also plated directly on blood-agar. At the same time a swab from the nasopharynx was plated on blood-agar. (See Table VIII.) The influenza bacillus was recovered from the sputum in 75 per cent. of the cases and slightly less often from the nasopharyngeal cultures. The pneumococcus was found in the sputum in 10 cases and in the nasopharynx in 6. Seven of the latter were tested for agglutinability and bile solubility and 6 found to belong to Group IV and one to Group II. In regard to the mouse inoculation, it is worth noting that the influenza bacillus was frequently obtained from the heart's blood of the mouse after death, and that the pneumococci, although frequently found in the blood or peritoneal cavity of the mouse, never grew in profuse and almost pure culture in the peritoneum, as is usually the case when mice are injected with the sputum from typical lobar pneumonia.

TABLE VIII.—CULTURES FROM SPUTUM AND NASOPHARYNX.

Thirty-two cases of influenza without pneumonia from "Transport 56."

	Sputum, direct culture.	Sputum injected into mouse.		Naso-pharyngeal swab cultures.
		Peritoneum.	Heart.	
Number of cases examined	29	22	22	24
Influenza bacillus	22	16	15	19
Pneumococcus	9	10	10	6
Streptococcus hemolyticus	1	0	0	3
Staphylococcus aureus	7	7	1	1
Streptococcus viridans	2	2	1	1
Gram-negative diplococci	13	6	4	15

These observations were not made until the epidemic in troops from this transport had begun to subside, and it was quite possible that the original infecting agent might be missed. At this time, however, a number of secondary cases developed among the hospital personnel and among troops in contact with the men of this transport at a rest camp. Forty-eight sputum cultures from such cases made by Lieut. F. B. Harrington (See Table IX) showed the presence of the influenza bacillus in 32; and in 23 of the cases it was found practically in pure culture, being mixed with only a few colonies of the organisms ordinarily found in the upper respiratory tract.

TABLE IX.—SPUTUM CULTURES FROM CAMP HOSPITAL NO. 35, OCTOBER 10 TO OCTOBER 31.

Influenza alone	23
Pneumococcus alone	7
Influenza and pneumococcus mixed	9
Streptococcus hemolyticus	5
Influenza pneumococcus and streptococcus mixed	1
Streptococcus hemolyticus and pneumococcus	1
Streptococcus and influenza	2

At Base Hospital 29, 70 sputum examinations were made—39 by mouse inoculation and 31 by the Avery tube. The results were:

	Cases.	Per cent.
Pneumococcus, Type II	5	4
Pneumococcus, Type III	7	10
Pneumococcus, Type IV	60	86

The influenza bacillus was not recovered. Of sputa from 7 cases of advanced pneumonia at American Red Cross M. Hospital 4, 2 showed pneumococci alone; 4 pneumococcus and B. influenzæ; and 1 pneumococcus and streptococcus.

SUMMARY. 1. Epidemiological, clinical and pathological observations of the epidemic of influenza as seen in American troops in England are presented.

2. From the epidemiological findings it appears that we are dealing with a highly contagious acute respiratory tract disease. It further appears that the mortality is about twice as high on board transports as on shore—namely 4 per thousand per month at sea and 2 per thousand per month on shore.

3. The most effective measures found for controlling the outbreak and for diminishing the mortality have been found to be (*a*) prompt isolation of all men showing temperatures and (*b*) increasing the amount of space allotted to a man. No conclusive evidence is at hand that masking and prophylactic spraying are effective, but the authors believe that these measures may properly be carried out, but are not to be solely relied upon.

4. In the matter of hospitalization it appears pretty definitely that it is highly important that cases be moved as little as possible and that they be got to bed with a minimum of delay. Long journeys in hospital trains are distinctly inadvisable.

5. In regard to the higher mortality seen at sea it is probable that various debilitating circumstances, such as unpalatable and hence insufficient food, broken and insufficient sleep, poor ventilation, overcrowding and exposure to cold and wet, all may have served to lower the individual resistance to the disease. But it is probable that the high mortality was determined not so much by these factors as by the virulence of the infecting organisms. It must be borne in mind that the troops were all newly recruited and that they left cantonments where a highly virulent organism was prevalent.

6. Clinically, it seems probable that the original infection is an entity. That when uncomplicated the mortality is nearly zero, but that bronchopneumonia frequently develops and is responsible for practically all the deaths. The type of bronchopneumonia is unusual. It may be exceedingly fulminating and almost explosive in extension, or it may be subacute, running a course of ten days to two weeks. It is usually associated with a purulent bronchitis. The cause of death in the fulminating cases may be suffocation, in the less rapid ones toxemia. The peculiar features of the pneumonia are the deep cyanosis, with no cause obvious in the circulation, the absence of pain and orthopnea, the frequent epistaxis, the purulent and blood-streaked sputum and the leukopenia.

7. No curative measures of value have been found. In the pneumonia, oxygen administered may or may not alter the cyanosis, but in any event does not seem to alter the course of the disease. Treatment in general must necessarily be entirely symptomatic. Venesection and saline infusion have not shown any beneficial effect. Digitalis has been used extensively, but in the majority of cases there is no clear-cut evidence of cardiac incompetence.

8. As to etiology it is impossible, from the reported findings, to draw definite conclusions as to the primary infecting organism. The streptococcus, pneumococcus, staphylococcus and meningococcus were found so irregularly that we believe they can be excluded as secondary invaders. The influenza bacillus was found postmortem frequently, but by no means constantly. However, it was found more frequently in the early part of the epidemic than in the late, and in the early cases it was often the only organism in the consolidated lung. It was found more frequently in the freshly consolidated lung than in older lesions. It was also found with considerable regularity in the sputum and nasopharynx of grip cases uncomplicated by pneumonia. These facts seemed to indicate that the Pfeiffer bacillus was the primary cause of the epidemic, though the evidence is not conclusive. The observations of Charles Nicolle at Tunis of the presence of a filterable virus offer an alternative explanation. In conclusion, we can only state that this epidemic was due to infection by either the bacillus of Pfeiffer or by some microörganism not recoverable by the methods employed.

THE UNIDENTIFIED PANDEMIC DISEASE (INFLUENZA?).

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The pandemic of acute respiratory disease which started in Europe in 1918 is still unidentified. Clinically and pathologically it is a new disease, differing widely from familiar maladies and epidemics within our experience or described in the literature of medicine. The etiology, in fact, of epidemics which have come down through history as "influenza" is fully as uncertain as the present one, during which the opportunities for accurate laboratory study have been unprecedented. The ultimate solution of this problem must rest with the bacteriologist.

The disease is still epidemic in many quarters and the persistence of scattered cases when the epidemic first appeared makes it extremely probable that it will be added to the category of endemic contagious diseases. The prompt recognition of isolated cases is exceedingly important for the individual and the community. An opportunity for the study of the disease has been offered in our military hospitals, which is not liable to be duplicated.

The clinical material on which this communication is based comprises about 1500 cases under observation from the beginning of the epidemic until the middle of December at U. S. Army General Hospital No. 1 (Columbia War Hospital), Williamsbridge, N. Y.;

about 200 cases at U. S. Army General Hospital No. 25, Fort Benjamin Harrison, Indiana.

CLINICAL CHARACTERISTICS. The disease is almost always sudden in its onset, with headache and general malaise, followed in a few hours by a chill or chilly feeling and a sharp rise of temperature. Occasionally there are mild prodromata for several days. Usually at onset the eyes, nose and throat feel scratchy and early appear congested. The red, dry eyes are strikingly characteristic. Inflammatory changes in the pharynx and tonsils are rarely shown. The face and entire body present a flushed, congested, almost cyanotic appearance in the more severely ill. The apathy of the patients is extreme, the chief desire being to be undisturbed. Prostration does not accurately describe the condition, as the body is frequently in universal flexion and the patient sits up energetically if sufficiently aroused.

Cough is almost always present from the outset. Substernal distress or pain is common and sometimes decidedly out of proportion to the severity of the cough. The temperature elevates quickly to 101° to 104° F. The pulse and respirations are not accelerated until late in the disease. Nose-bleed is common, continuing intermittently for several days in the more severe cases.

In the mild or uncomplicated cases the temperature reaches normal in forty-eight hours, elevating possibly at night for a day or two more. Persistence of temperature beyond the third day is to be regarded as an evidence of deep invasion of the pulmonary tissues.

The leukocyte count is low almost without exception. Counts of 2000 to 3000 were not unusual and a leukocyte count of 9000 to 10,000 was looked upon with suspicion. Blood cultures were universally negative early in the disease. Albumin and casts in the urine was the rule in the more severely ill.

We are dealing then with an acute infection which in approximately 80 per cent. of cases lasts only two or three days, characterized by rapid onset, substernal pain and cough, suffusion of the eyes, face and body, but without much evidence of coryza, tonsillitis or pharyngitis. On the return of the temperature to normal the patient is not strikingly weak.

COMPLICATING CONDITIONS. Inflammation of the larynx occurs after the first week or ten days in approximately 5 per cent. of cases, manifesting itself by hoarseness, pain in the larynx and sometimes a well-developed aphonia.

Nausea and vomiting in the first days of the disease occurred frequently in the more severely ill. In a few cases vomiting was persistent and prostrating. Hematemesis was seen in two fatal cases, both at autopsy, showing a hemorrhagic gastritis with superficial erosions. The term "gastro-intestinal type" may be used to describe those cases in which vomiting is a feature of the disease, but the

constant lesion is pulmonary and a fatal outcome is the result of the peculiar pneumonitis.

A scarlatiniform rash which could only be differentiated from scarlatina by the absence of the characteristic tongue and throat was seen six times in our series. While this disease prevails a diagnosis of scarlatina should be guarded, especially when there is evidence of respiratory involvement.

Femoral phlebitis occurs occasionally late in the disease. It is, so far as our experience goes, merely a long protracted disabling condition.

In many severe cases the urinary output is low and the albumin and casts of all kinds in the urine abundant. We could not see that this was a matter of great clinical importance. Toxic symptoms referable to the kidneys were not observed. Apparently the kidneys were excessively congested and acutely inflamed, but the recovery of function was rapid and complete as the disease subsided.

Meningitis is said to have occurred, but it is our opinion that the meningeal symptoms are toxic. In the one real meningitis seen during convalescence from a supposed "influenzal meningitis," an abundant growth of meningococcus was obtained from the retropharynx. In another tubercle bacilli were found in the spinal fluid.

A mild happy delirium which leads to an exaggerated sense of euphoria is common in the more severely ill. Late in the disease an unreasonable active delirium was occasionally seen. The mental state in the disease undergoes interesting changes; at onset there is striking apathy, later euphoria, and finally in some fatal cases an active or low muttering delirium.

PNEUMONITIS. The trachea and larger bronchi are regularly the site of infection and the spread of the inflammatory process largely determines the severity of the disease. In the mild cases signs of bronchitis are absent. As the disease spreads along the bronchial tree an intense congestive serohemorrhagic inflammation of the mucosa develops, with more or less peribronchial exudate or infiltration. Lobules are then picked out and more or less consolidated by an exudate poor in leukocytes and fibrin and rich in red cells. These lobules may fuse into large lobar consolidations, with a characteristic exudate. There is then a peculiar type of tracheitis, bronchitis and bronchiolitis, with or without scattered areas of peribronchial or lobular pneumonia, with or without typical lobar pneumonia. The characteristic process is a generalized serohemorrhagic pneumonitis. It is impossible to draw a sharp line of distinction between the pneumonias and the "not-pneumonias." From this fact has arisen much confusion. Clinically the cases fall rather sharply into four groups:

GROUP 1. *Mild Peribronchial Cases.* These patients do not seem much worse than those who recover perfectly in two or three

days. The temperature is practically normal, but they continue to cough and feel poorly, frequently breaking out in cold perspiration on the slightest exertion. While the physical signs may not be conclusive the radiographs show more or less peribronchial infiltration. They continue to cough and feel weak for several weeks, and probably during this period are a source of danger to those about them.

GROUP 2. *Recrudescent Cases.* After one to seven days of apparent convalescence from a mild form of the disease a few patients were suddenly taken with a chill, cough, bloody expectoration and a rise of temperature. Usually these cases immediately showed signs of massive consolidation. It seemed probable that there had been a cross-infection in the wards after recovery from the original infection.

GROUP 3. *Severe Toxic Cases.* Usually from the onset a severe infection evidenced itself by the appearance of the patient, the bloody expectoration and the harsh breathing throughout the chest. Frequently it was obvious that the outlook was hopeless solely from critical inspection rather than definite evidence of cardiac failure or pulmonary inflammation. The sputum in these cases is either a thick, tenacious, blood-tinged sputum or less frequently a thin serosanguineous fluid or even pure blood.

GROUP 4. *Fulminant Form.* The course of the disease is occasionally very rapid, death following the time of "giving up" by only a few hours. The cyanosis is extreme, the dyspnea and anxiety frightful. In this group the congestion, exudation of serum and actual hemorrhage into the bronchi and alveoli is exceptionally severe and the patient is drowned in his own fluids. The pulmonary edema is not due to cardiac failure but to an unusual reaction of the tissues to this peculiar infection.

DIAGNOSIS. During an epidemic the diagnosis is usually simple. At any time a severe case would at once strike the clinician as being a different disease. Mild isolated cases would be diagnosed with difficulty. They closely resemble typhoid in many symptoms and laboratory findings. Diagnostic tests were watched from day to day in several instances late in the epidemic, in the expectation that a diagnosis of enteric fever would be justified. The spleen may be palpable and slightly suggestive spots be found on careful scrutiny. Many diseases are and will continue to be called "influenza" that are not. This mistake will seldom occur if one recognizes that the infection is pulmonary and the severity of the disease proportional to the pulmonary involvement. The early recognition of the pneumonia is frequently difficult, as actual lobar consolidation may never develop even in the case that terminates fatally as late as the tenth or twelfth day of the disease. Clinically the diagnosis rests on the appearance of the patient, the bloody sputum, slight changes in voice and breath sounds over small areas and the presence of crepitant rales. Reliance on physical signs is dangerous.

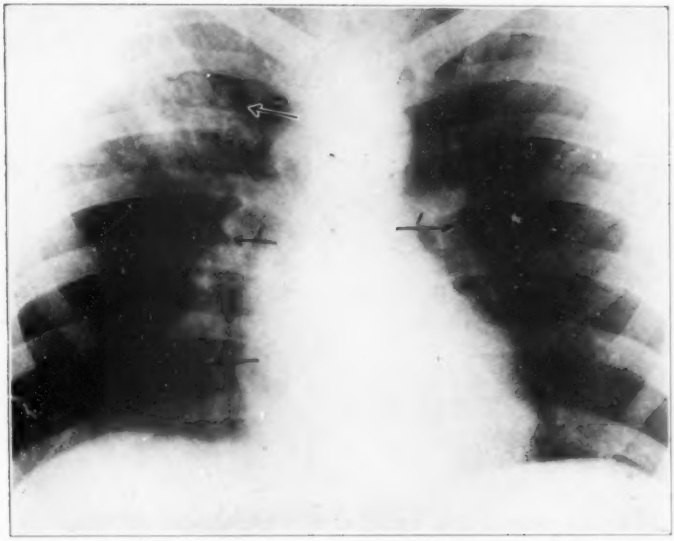

FIG. 1.—Arrow 1, peribronchial infiltration; arrow 2, slight extension to the upper lobe along the bronchial tree; arrow 3, similar extension to the right base.

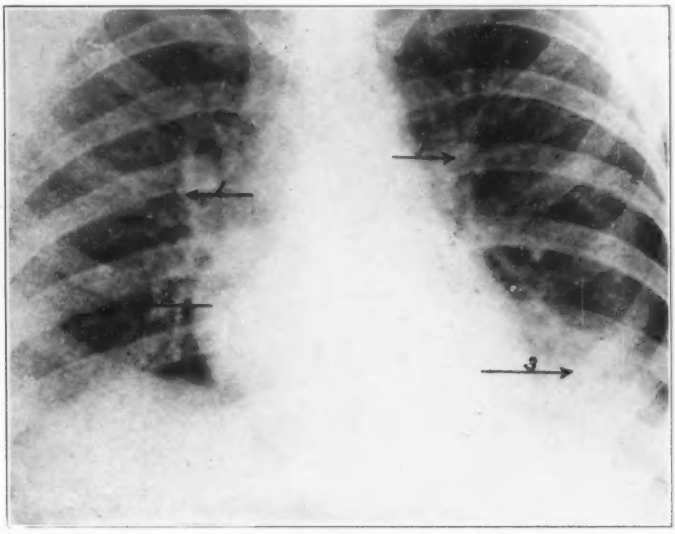

FIG. 2.—Arrow 1, peribronchial infiltration; arrow 2, slight exaggeration of the bronchial tree; arrow 3, beginning consolidation at the left base.

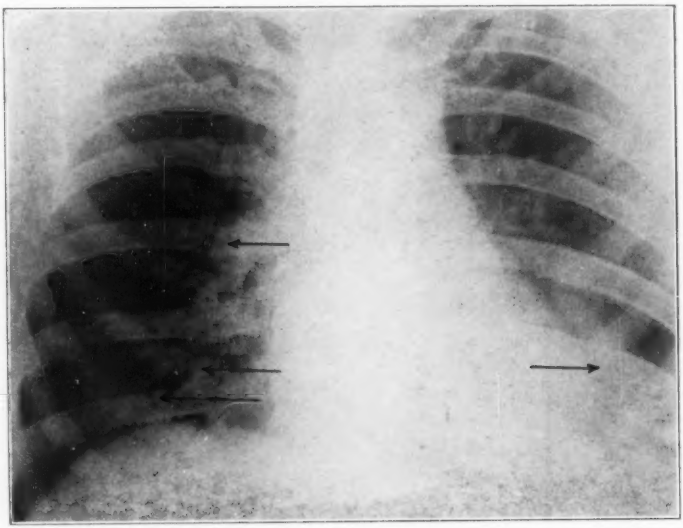

FIG. 3.—Root infiltration with beginning consolidation at both bases. Physical signs at the bases in this stage only; slight dulness, rales, prolonged high-pitched expiration and somewhat high-pitched voice.

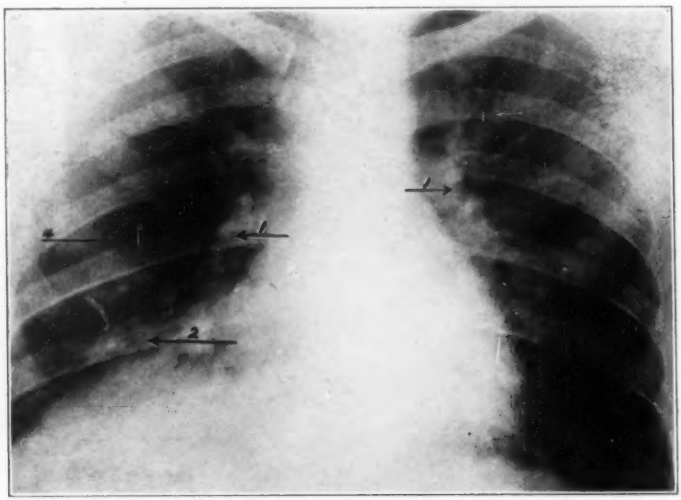

FIG. 4.—Arrow 1, root infiltration; arrow 4, diffuse process in and outside the bronchi; arrow 2, extension to the base as shown on next plate.

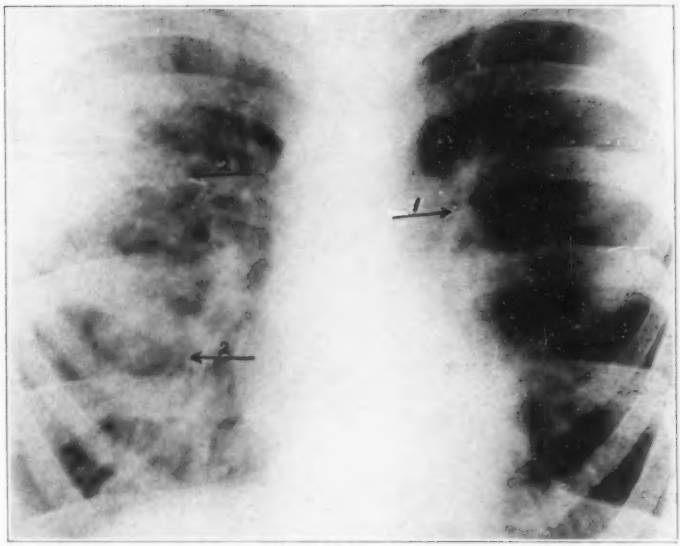

FIG. 5.—Scattered lobular consolidations, with a diffuse peribronchial infiltration and intrabronchial exudation. Definite consolidation at arrow 1, signs of which are heard high in the axilla.

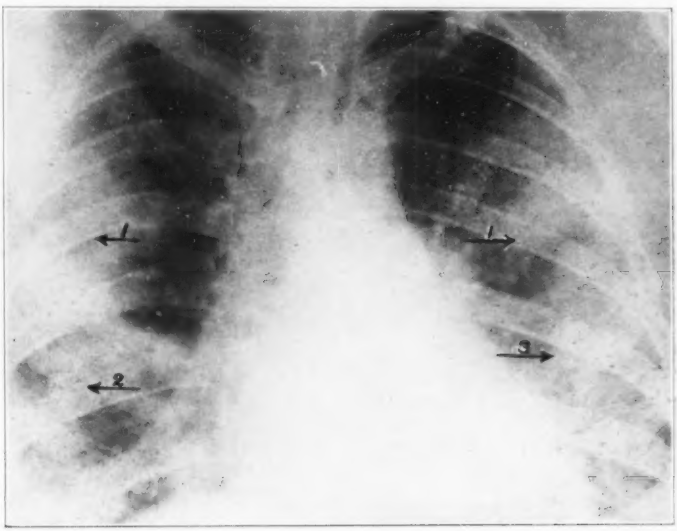

FIG. 6.—Very diffuse process, with definite consolidations at the arrows. This consolidation of the lobular type, some air in the affected lobes, signs not absolutely complete.

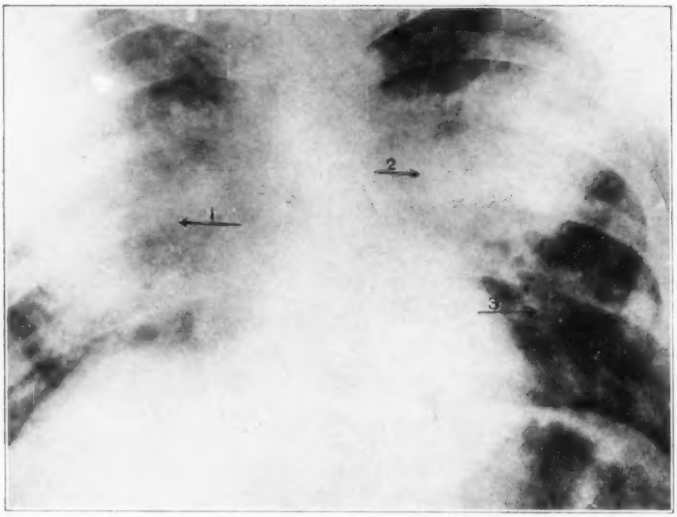

FIG. 7.—Taken forty-eight hours after Fig. 6.—Massive consolidations at arrows 1 and 2, with diffuse process at arrow 3 and elsewhere.

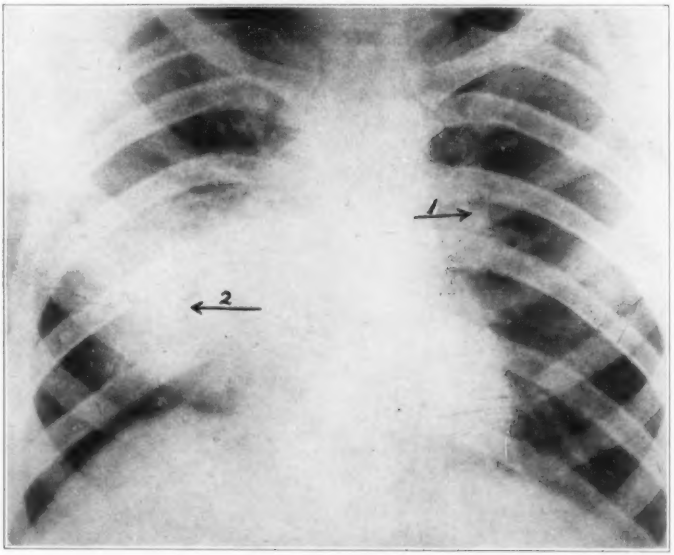

FIG. 8.—Arrow 1, peribronchial infiltration; arrow 2, complete consolidation of the middle lobe; general exaggeration of the bronchial tree from the serum in the bronchi and infiltration around.

COURSE OF PNEUMONIA CASES. In Chart I is shown the percentage of deaths on different days of the disease. There were few before the fifth day and very seldom one after the eleventh.

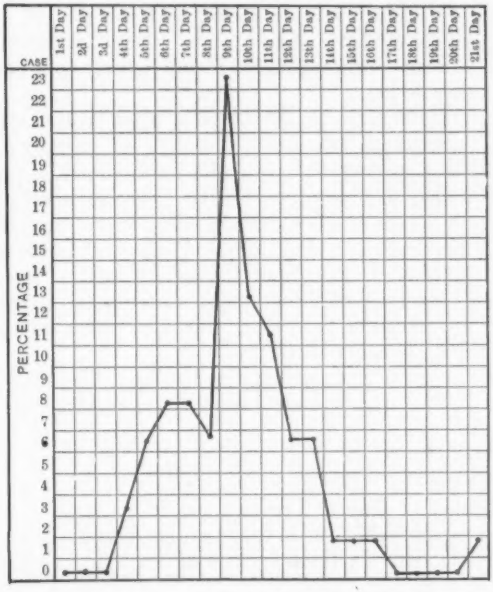

CHART I.—Mortality chart. Death incidence on different days of disease.

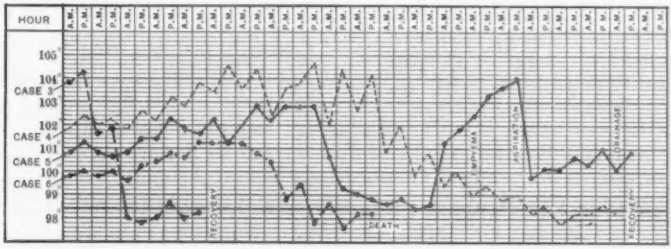

CHART II.—Showing variations in temperature curve. Case III. Short form of pneumonia with natural crisis. Case IV. Obstinate form, temperature normal by lysis on twentieth day. Case V. Fatal case in spite of fall of temperature to normal. Case VI. Pneumonia with crisis and temperature rise from empyema.

In Chart II is shown the number of cases reaching convalescence on different days of the disease and admission to the hospital. Late in the epidemic a number of cases were seen that ran a mild but prolonged course.

Recovery came by crisis in only 20 per cent. of cases treated symptomatically, but the crisis in this disease is not the striking phenomenon seen in pneumococcus lobar pneumonia.

The Obstinate Cases. Prolonged fever and delayed convalescence were always watched with suspicion and the patient frequently radiographed for evidence of empyema. There are, however, cases in which the long-continued illness is due entirely to a pneumonitis without other lesion.

Empyema Incidence. In the series of cases treated symptomatically few empyemas developed, although at autopsy conditions were found that suggested the probable development of pus had the patient not died so promptly. In the "protein injection series," in which the death-rate was much later, seven empyemas were drained by operation and three subsided following simple aspiration. We were confirmed in the opinion formed during the "streptococcus pneumonia" epidemic of the previous winter that the early recognition of complicating empyema depended upon routine radiography and exploratory puncture.

Pneumothorax and Subcutaneous Emphysema. Spontaneous pneumothorax has been a peculiar complication of this disease. Frequently the cavity has been small and impossible of recognition except on careful study of the radiograph. Subcutaneous emphysema involving the upper chest and even the entire trunk has been seen a number of times. The two conditions may be associated. The rupture is probably due to the excessive dilatation of the lobules of the upper lobes. Of the five cases of emphysema coming under observation none were fatal.

PROGNOSIS. The mortality of the disease, judging from reported figures, has been from 5 to 10 per cent. of all cases affected and 25 to 40 per cent. of all recognized pneumonias.

Prognosis in the individual case is usually possible from the first few days of the disease, when one becomes familiar with the appearance of the sick patient and is not led astray by the slow pulse and respiration rate, the low temperature and the absence of signs of consolidation. The temperature may fall to normal several days before death, rising only immediately before the end. Death does not come essentially from cardiac failure. Usually the respirations become shallow and rapid, the dusky pallor more pronounced and consciousness becomes constantly clouded. In this condition the patient may last several days.

RADIOGRAPHIC STUDY OF THE PATHOLOGY. The radiographic findings are very different from lobar pneumonia in which an exudate into the alveoli and a proportionate absence of air gives rise early to unmistakable densities. The bedside portable apparatus made possible the daily routine study of a large number of cases, some of which were later studied at the autopsy table.

In the simple "influenzas" the radiographic findings were negative.

Apparently the pathological process was so limited to the trachea and larger bronchi that abnormal densities were not shown. In the pneumonitis cases the radiographic studies showed the same wide variation in site and density of lesion that were shown at autopsy. In general it may be said that these varying pictures were made up of four elements, as follows: (1) The enlarged hilum markings, apparently the result of exudation within and around the larger bronchi; (2) an exaggeration of the shadow of the bronchial tree caused by an extension of the process to the smaller bronchi and bronchioles; (3) irregularly scattered densities that represented areas of lobular consolidation; (4) large areas of density arising from the consolidation of a large portion of an entire lobe or lobes. The first, second and third elements are to be regarded as progressive steps in the process. An excellent idea of the prognosis could be obtained by serial radiography. The severe toxic cases always showed early the irregularly scattered densities of lobular consolidation. The lobar consolidations developed either as a result of the fusing of the lobular process as seen day by day radiographically or developed rather suddenly in an area such as the extreme base or the middle lobe which on the plate twenty-four hours previously had seemed unaffected. These studies confirmed our opinion reached from the clinical side that the pathology of the disease as seen at autopsy was first the characteristic serohemorrhagic pneumonitis extending along the bronchi, and second the incidental development of lobar consolidations with the classical exudate into the alveoli. We were satisfied that the prognosis was comparatively good in the cases which developed definite lobar consolidations without generalized bronchial and peribronchial exudate and lobular consolidation.

TREATMENT OF THE DISEASE. Aside from rest in bed and isolation from other patients to prevent cross-infection it was unnecessary and useless in the majority of cases to attempt interference with the course of the disease. Even the relief of symptoms by drugs was found unsatisfactory. The question arises whether anything can be done to limit the spread of the inflammatory process and assure recovery. A well-controlled series of cases was treated by the hypodermic administration of mixed vaccines immediately on admission, with no apparent result. It seems possible that the increase of the dose of the injection to the point of causing a protein reaction would be justified as a routine as soon as possible after the onset.

The recognized pneumonia cases were isolated in special wards and each protected from the other with every possible care. Rest was insisted upon, if necessary by mild hypnotics or codein or morphin. A large proportion of our patients were digitalized as soon as possible, using a large dose of the standardized tincture. The conclusion was reached that the practise was free from danger and that it was possibly useful in a small number of cases. Cardiac

failure was not the cause of death, and without digitalis few patients showed any evidences of fibrillation until they were actually moribund. As a quick diffusible stimulant, camphor in oil seemed most useful. Pituitrin was of great value in the relief of abdominal dis-

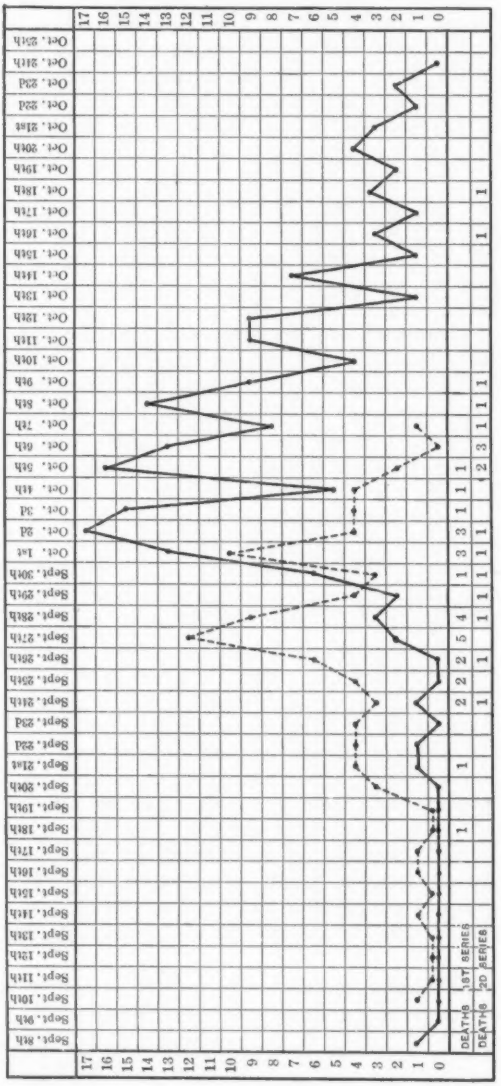

CHART III.—Incidence of onset of pneumonia cases in two series. Broken line, first series, expectant treatment. Solid line, second series, bacterial protein injections. Figures below show the fatal cases in each series. Note.—During period prior to October 5 the death-rate in "protein injection" series was 11.9 per cent, against 31.3 per cent. in the first series. Total mortality: first series, 31.3 per cent.; second series, 9.6 per cent.

tention. Whisky has again come into favor in the handling of these pneumonias, although from our experience it has no particular

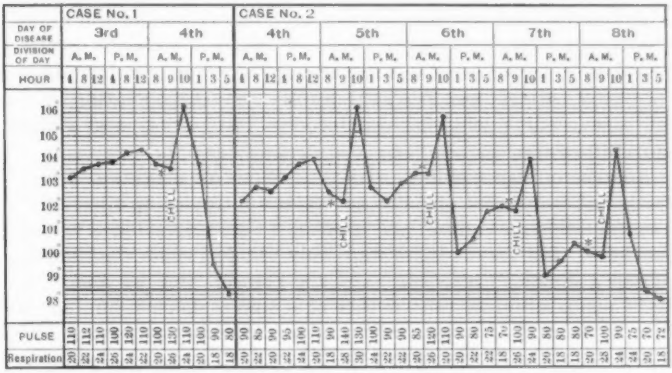

CHART IV.—Illustrating characteristic "protein reaction." Asterisk indicates the time of protein injection, regularly one-half hour before the chill. The charts give the complete febrile course of the disease in each case.

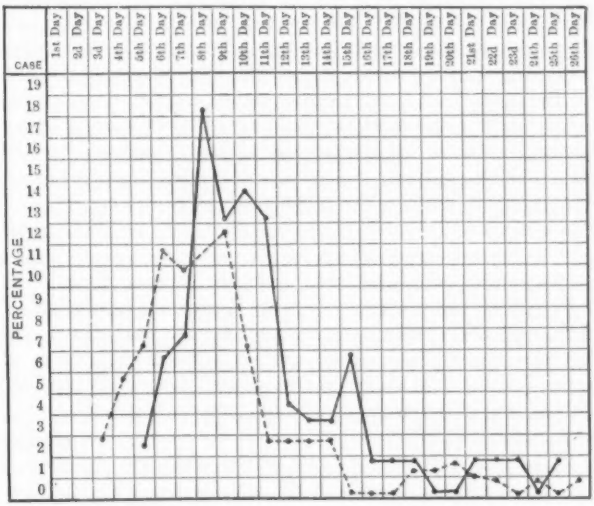

CHART V.—Showing percentage of cases reaching normal temperature on successive days of the disease. Solid line, first series, 86 cases, expectant treatment. Broken line, second series, 200 cases, protein injection treatment.

value. Cupping, counter-irritation and pneumonia jackets have proved entirely useless. Phlebotomy has occasionally given slight relief, but it has never shown the salutary effect on pulmonary

edema that is frequently seen in the sthenic type of lobar pneumonia with right-sided heart failure.

INTRAVENOUS BACTERIAL PROTEIN INJECTIONS. Our experience with specific plans of treatment has been largely confined to the use of mixed vaccines sufficient in amount to produce a definite "protein reaction."[1] In the small number of cases in which transfusion from recovered patients was tried the results were disappointing. In a few cases a polyvalent antipneumococcus vaccine was used without apparent result.

Because of the appalling mortality under an expectant plan of treatment we started on October 3 to use intravenous injections of a mixed influenza vaccine, and contrary to our original idea we soon concluded that good results were only secured when the injection caused a definite "reaction." At the present time we regard the exact composition of the vaccine as a minor matter, but believe that to secure the reaction the initial dose should be approximately 1,000,000,000 heat-killed organisms injected intravenously, and probably several times this dose if administered subcutaneously or intramuscularly. The typical reaction is shown in graphic Chart I to consist of a chill or a definite chilly sensation one-half hour after the injection, accompanied by a rise in pulse-rate and sometimes by a slight fall in temperature. The temperature then elevates, quickly reaching a maximum in a half to one hour, when it falls, sharply, as a rule, but usually rises again. The rise following the chill is always transitory and is overlooked unless temperatures are taken every half-hour. The subsequent fall may be to normal after the first, second or third injections, the disease terminating by crisis. After the chill the patient almost invariably feels greatly improved and the change in appearance and lung signs is often striking. The injections have routinely been repeated every twenty-four hours, although a shorter interval may be found to be an improvement. No ill effects have ever been attributable to the treatment.

COMPARATIVE MORTALITY. In a consecutive series of 200 cases of definite influenza pneumonias treated by this plan the mortality was 9.6 per cent. This was in striking contrast to a series of 86 consecutive cases treated by an expectant plan with a mortality of 31.3 per cent. No case was excluded from either series because of the hopelessness of the condition of the patient on admission. During a period in which the cases in the two series overlapped in the incidence of onset there was the same relative mortality as is shown in Chart III. The betterment in results cannot be attributed to a difference in the period of the epidemic.

By this plan of treatment not all cases can be saved, but we were convinced that many cases which were naturally fatal recovered promptly in the most striking manner.

[1] Jour. Am. Med. Assn., 1919, lxxii, 22.

Non-specific protein injections have already found considerable favor in the treatment of the arthritides. It would seem from our experience that it offers great possibilities in the treatment of any acute infectious disease, but particularly of one with an unknown etiology and consequently no possibility of producing an immune animal serum.

PNEUMONIA AS A COMPLICATION OF EPIDEMIC INFLUENZA.

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Introduction. The material for this study was formed from 39 cases of pneumonia occurring in the course of the epidemic of influenza in Flanders and northern France during the fall of 1918. The patients, fourteen of whom were British and twenty-five of whom were American soldiers, were sent to this hospital, in Boulogne, between October 25 and December 7, 1918, from twelve widely separated field hospitals and casualty clearing stations. The most striking feature of the series was that 25 of the 39 cases had lobar pneumonia due to pneumococcus infection. This diagnosis was supported by bacteriological evidence in the form of positive blood cultures. The high mortality allowed confirmatory evidence as to the character of the lesion at necropsy.

Various papers on the pandemic of influenza which occurred during the fall months of 1918 have shown that lobar pneumonia was seldom found. A few studies, however, reported it as of frequent occurrence. It is evident that the nature of the pulmonary changes varied in different districts and countries. According to Horder's[1] observations in St. Bartholomew's Hospital, London, the respiratory manifestations extended from laryngitis and tracheitis through bronchitis to lobular and lobar pneumonia. But the characteristic feature, and one which was seldom absent in any severe case, was a condition of capillary bronchitis with intense pulmonary congestion. Cases of true bronchopneumonia did not seem common. On the other hand, Christian,[2] at the Peter Bent Brigham Hospital, Boston; Keegan,[3] at the United States Naval Hospital, Chelsea; Nuzum, Pilot, Stangl, and Bonar,[4] in Cook County Hospital, Chicago; Friedlander, McCord, Sladen, and Wheeler,[5] at Camp Sheridan, Ohio; Synnott and Clark,[6] at Camp Dix, New Jersey; Abrahams, Hallows and French,[7] in the Connaught

Hospital, Aldershot, and Blanton and Irons,[8] at Camp Custer, Michigan, found bronchopneumonia in their fatal cases and believed that true lobar pneumonia was uncommon in association with influenza. In contrast to this opinion, Muir and Wilson,[9] of the Third and Fourth Scottish General Hospitals, Glasgow, found lobar pneumonia, or a combination of lobar and bronchopneumonia, in 34 per cent. of 26 necropsy examinations; Hall, Stone, and Simpson,[10] at Camp Logan, Texas, made a diagnosis of lobar pneumonia in all but 50 of 416 cases of influenza-pneumonia. These cases, under observation between September 13 and October 8, 1918, are the only ones reported in which lobar pneumonia was the chief complication.

A great diversity of bacteriological findings has also been characteristic of the epidemic. Keegan[3] recovered the bacillus of influenza from the lungs at necropsy in 82.6 per cent. of 23 cases of post-influenzal bronchopneumonia, and McIntosh,[11] in the London Hospital, isolated the same organism in 68 per cent. of 19 fatal cases of bronchopneumonia. These results are in striking contrast to the work of others. Blanton and Irons[8] recovered streptococci from 451 of 740 sputa and pneumococcus 148 times. The streptococcus was also the chief organism isolated by Fildes, Baker and Thompson[12] at the Royal Naval Hospital, Haslar, England and by Strouse and Bloch[13] in Michael Reese Hospital, Chicago. The pneumococcus, on the other hand, is described as the predominating organism by Nuzum, Pilot, Stangl, and Bonar,[4] who recovered this organism from the lungs at necropsy in 75 per cent. of 34 cases, and by Friedlander, McCord, Sladen and Wheeler,[5] who found it regularly in the sputum of 2000 cases having pneumonia and from cultures at necropsy in 53.3 per cent. of a large series of fatal cases. Similar results were obtained by Hall, Stone and Simpson,[9] who isolated the pneumococcus from the sputum of 302 pneumonia patients. Other writers, notably Abrahams, Hallows and French,[7] placed emphasis upon a diplostreptococcus as a chief secondary invader. Whittingham and Sims,[14] of the Central Hospital and Military Hospital, Hampstead, England, found Micrococcus catarrhalis the predominating organism in 34 per cent. of 50 consecutive cases of influenza, and finally Fletcher,[15] in the University War Hospital, Southampton, England, and others have found the meningococcus in pure cultures. Blood cultures, by many of the workers mentioned, have yielded negative or indifferent results.

In brief, experience has shown that bronchopneumonia has been the common severe pulmonary complication of influenza, whereas lobar pneumonia has been one of infrequent occurrence. Furthermore, the etiology of the pneumonia has been attributed to many organisms, among them the bacillus of influenza, streptococcus, pneumococcus, diplostreptococcus, Micrococcus catarrhalis and meningococcus.

METHODS OF STUDY. Many patients having influenza were admitted to this hospital during the epidemic. The frequent complication of lobar and bronchopneumonia necessitated the isolation and individual care of those who were found to be most seriously ill. The patients in this series represent, therefore, a selected group of especially severe cases. They were observed in an isolation ward of thirteen beds, each bed being in a separate cubicle. Special nurses were on duty day and night, and all persons who came in contact with the patients wore protecting gowns and masks. In every case a careful history and physical examination was made upon admission and daily chest examinations were made thereafter. No special treatment was given except for the routine administration of digitalis and the forcing of fluids.

The cases were studied more closely by the following laboratory methods:

1. *Blood Cultures.* Whenever possible a blood culture was made in every case upon admission to the ward. If negative, it was repeated once or twice in several cases. Ten centimeters of blood were obtained by venepuncture and inoculated into a large tube containing 50 cm. of 1 per cent. glucose broth. The cultures were examined at the end of twenty-four and forty-eight hours. The pneumococcus, which was the only organism recovered from the blood stream, was identified by the following characteristics:

(*a*) Greenish culture in blood bouillon.

(*b*) Diffuse cloudiness in bouillon with no flocculent precipitate and very little settling.

(*c*) Pneumococcus-like colonies on blood agar.

(*d*) Bile solubility (not always tested).

(*e*) Typing with sera distributed by the Rockefeller Institute.

2. *Sputum and Lung Cultures.* Stained smears of sputum were examined in all cases in which specimens were obtainable, and attempts were made to isolate the pneumococcus by Avery's[16] method. Lung cultures were made in a few cases in which sputum was unobtainable.

3. *Necropsy Examinations.* Necropsy examinations were made as soon as possible after death. Cultures from this material were not extensively studied.

LOBAR PNEUMONIA. The histories of the 25 cases of lobar pneumonia were essentially the same as in the cases of bronchopneumonia The common story was one of sudden onset of fever, marked prostration and generalized aching pains characteristic of influenza. Many cases of influenza were seen in the hospital, in which recovery from the acute attack had occurred, but which developed pneumonia within one to four days afterward. Three such cases are included in this series. In the majority of cases, however, no history of an afebrile period preceding the pneumonia could be obtained. The diagnosis of lobar pneumonia was made upon the physical signs of

consolidation in the lungs. Such signs were usually found at the time of the first examination. Other factors considered were the temperature curve, toxemia, course of the disease and character of the sputum.

In 8 surviving cases signs of frank consolidation were found as follows: Right lower lobe, 5; both lower lobes, 1; right lower and right upper lobes, 1; both lower and right upper lobes, 1; in 17 fatal cases the lobes involved were: Right lower lobe, 1; left lower lobe, 4; both lower lobes, 6; both lower and right upper lobes, 1; both lower and left upper lobes, 1; left lower and left upper lobes, 1; right lower and right upper lobes, 1; In the 2 remaining cases there were signs of consolidation in one side and diffuse variable signs characteristic of bronchopneumonia in the other.

The temperature curve during the height of the disease was well sustained, usually between 102° and 105°. Crisis occurred in 1 case and the temperature fell in seven others by lysis. Probably crisis did not occur in more of the cases because of the extension of pneumonia to new lobes or to concurrent bronchopneumonia. There was, as well, a notable failure of the lobes which were first affected to show signs of resolution even after ten to fourteen days of complete consolidation. Such a spreading lesion with slow resolution indicated either a low resistance to the invading organism or an extremely virulent infection.

All of the patients showed severe prostration, rapid respirations and cyanosis of varying degrees. Delirium was a frequent symptom.

The sputum in the majority of cases was characteristic. Early in the disease it was blood-stained, semigelatinous, mucoid pus, which persisted in certain cases but usually changed to a purulent excretion. Extension of pneumonia to new lobes was often first noticed by the reappearance of blood-tinged mucus. None of the cases produced an unusual amount of sputum and in several instances no specimens could be obtained.

Of 25 cases of lobar pneumonia, 17 died and 8 lived. The average duration of pneumonia in the surviving cases was nine days; in the fatal cases, twelve days. These figures are only approximately correct, since it was impossible to determine the exact date of the onset of pneumonia except in a few cases. Other points of clinical interest were: The occurrence of laryngitis in 2 cases; jaundice in 1 case; sterile pleural effusion in 2 cases; empyema in 1 case; pleural pain at some time in 10 cases; 2 cases of purulent pericarditis and 4 cases of empyema found at necropsy were not diagnosed during life.

Bronchopneumonia. The diagnosis of bronchopneumonia was made in 14 cases upon the physical signs, as in the other series; but other data, such as the temperature curve, toxemia, sputum and the course of the disease were included. The cases were in no respect different from those described as bronchopneumonia by

other writers, with the exception that very little tendency to hemorrhage was observed.

One of the characteristics of the lung signs was the great variation noticed from day to day. For varying periods in some cases there was complete absence of pathological signs. Suppressed breathing at the bases was common. Moist, sticky, consonating rales were often present, and frequently patches of bronchial breathing in the interscapular spaces or near the scapular angles. During the closing days of the disease, in a few fatal cases, consolidation of one or both lobes was noted. In 6 cases no bronchial breathing was heard and in 8 it was found at some time during the course of the disease.

In several cases a high temperature curve persisted until death, but, as a whole, variations of as much as 5° between the morning and evening temperatures were not uncommon. In one case under observation for nine days the temperature did not exceed 100.8° until forty-eight hours before death, when it registered 102°.

As a whole the fatal cases showed a greater degree of cyanosis than was seen in the lobar type. The pulse-rates and the respiratory rates tended to be greater than in the cases having lobar pneumonia. The great depression of the majority of the patients from the beginning foretold a prognosis of a grave nature.

A characteristic sputum was produced in which, among other organisms, the bacillus of influenza was uniformly present. Grossly the sputum was pale green, purulent, nummular and at times was raised only after severe coughing. Cough was more frequent, severe and distressing than in the cases of lobar pneumonia, Signs of pleurisy were uncommon.

The total number of cases was 14; 11 died and 3 recovered. The average duration of the fatal cases was fifteen days; of those living, seventeen days. Other clinical facts to be noted were: The occurrence of laryngitis in 3 cases, pleural pain in 1 case and epistaxis in 1 case. At necropsy, dry adhesive pericarditis was found in 1 case, pleurisy in 2 cases and empyema in 1 case.

Case Histories. The protocols of 2 cases of lobar pneumonia and 2 cases of bronchopneumonia are given to illustrate in detail some of the differences already noted.

Case I.—W. B., American soldier, aged twenty years, was admitted October 31, 1918, with a history of sudden onset, four days previously, of chilly sensations, headache and generalized aching pains, particularly in the right shoulder. On November 2 he was found to have consolidation of the right upper lobe and on the following day signs of the same process throughout the left lower lobe. He was then moderately cyanotic and dyspneic and raised sticky blood-stained sputum. On November 4 his chest showed marked dulness over the right back, increasing to flatness at the base where tactile fremitus was absent. There was very little movement of the right chest. Bronchial breathing was heard

over the upper lobe, but gradually decreased in intensity and became absent at the base. The left chest presented dulness from the midscapula to the base, bronchial breathing, increased voice sounds and some moist rales. The right chest was tapped in the posterior axillary line but only 1 cm. of bloody fluid was obtained, which, on culture, grew pneumococcus Type II. Blood culture was negative.

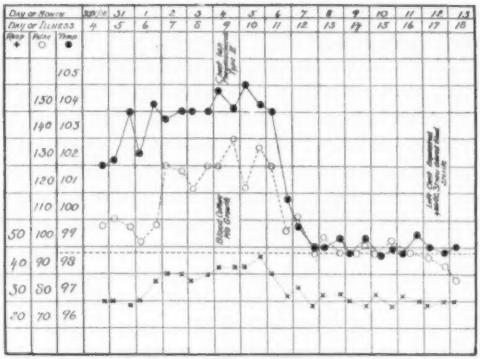

CHART I.

The temperature since October 30 had remained continuously between 103° and 105°; the pulse was usually 110 to 120 and respirations 30 to 45. On November 7 the general condition of the patient was greatly improved, the temperature having dropped to normal during the preceding thirty-six hours. There was less dulness at the right base. On November 8 he complained of pleural pain in the left chest, but no rub was heard. There was still frank consolidation of the left lower lobe. Throughout the right chest breathing was decreased and there were a few fine scattered moist rales. Fluoroscopy showed no evidence of fluid. By November 12 the right chest was rapidly clearing up. The left base however, was flat to the level of the scapular angle, with absent tactile fremitus and breath sounds. This base was tapped and 420 cm. of clear straw-colored fluid removed, which was sterile on culture. On November 15 the chest signs had disappeared except for some dulness and changed breathing at the left base, and the patient was in fine condition.

CASE II.—A. F. S., American soldier, aged twenty-six years, was admitted November 25, 1918. He had been ill for six days with headache and general malaise and had had a severe cold. Recently he had developed cough and pain in the right side of the chest. The chest examination was negative except for a few fine pleural rales at the right base. On the day after entry, however, there was moderate dulness over the right upper lobe posteriorly, with

increased vocal fremitus and bronchovesicular breathing. The left lung was clear. The sputum was blood-streaked. On the following day there was complete consolidation of the right lower lobe and signs of involvement of the lower one-third of the right upper lobe. There was some dulness over the left lower lobe but no change in the breath sounds. The sputum was sticky and rusty. The patient was cyanotic, but his condition was still good. Blood culture gave a positive growth of pneumococcus Type I. By November 29 there was intense bronchial breathing over the left base posteriorly and in the axilla. On the right the breath sounds came through less well. The sputum consisted chiefly of blood-streaked mucus. The temperature had been maintained at 103° or above. Cyanosis gradually increased, the pulse-rate and respiratory rate steadily mounted and the patient died December 2.

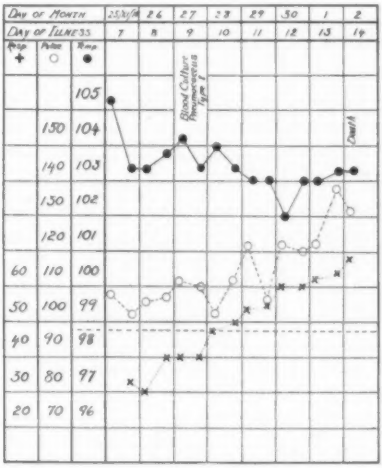

CHART II.

At necropsy a small amount of purulent fluid was found in the left pleural cavity, while in the right there was a moderate amount of more purulent fluid, with shaggy pleural exudate. The upper lobe of the right lung was completely consolidated; the cut surface was reddish-gray. The right lower lobe presented some edema and a considerable exudate of blood and fibrin. Sections of the tissue sank in water. The left lower lobe showed a generalized fibrinous pleurisy. There was complete consolidation, the cut surface being deep red in color. The upper lobe was edematous but presented no consolidation. Cultures from the lungs developed pneumococcus Type I.

CASE III.—T. F., British soldier, aged twenty-three years, was admitted November 10, 1918. He had been taken suddenly ill three days before with intense headache, generalized aching pains and hot and cold sensations. He had a little cough and complained of loss of appetite. His bowels were constipated.

At the right base posteriorly there was impaired resonance, with decreased breathing and scattered, moist rales were heard in both lungs. The patient was transferred to the isolation ward on November 20. His temperature had fluctuated daily from the date of entrance; the respirations had ranged from 24 to 36 and the pulse-rate from 90 to 100. The chest now showed moderate dulness at the right base posteriorly. There were numerous fine moist rales in both bases and on the right pleural rales were heard after cough. The sputum was light, greenish-yellow, airless pus, containing the bacillus of influenza and Micrococcus catarrhalis. A blood culture

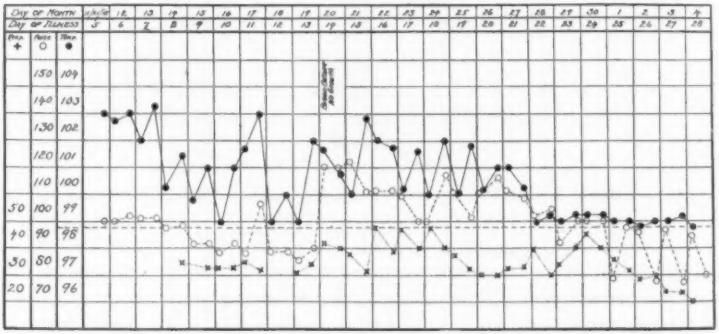

CHART III.

was negative. By November 25 the temperature was still fluctuating, but the general condition had improved. There was dulness on the right from the spine of the scapula to the base, with distant breathing and a few sticky, moist rales. Many similar rales were heard in the left lower lobe. On November 27 the left lung was clear, dulness on the right had increased and breath sounds at the base were faint. A chest tap proved negative. Fluoroscopy showed nothing remarkable on the left side, but on the right there was increased density, slight at the apex, increasing to the base, but not suggesting fluid. The diaphragmatic movements were restricted on both sides. On December 1 the lungs were clearing up and the patient was rapidly improving. The temperature had been normal since November 28.

CASE IV.—G. F. R., American soldier, aged twenty-eight years, was admitted November 6, 1918, with a diagnosis of gunshot wound of the right deltoid, from which the foreign body had been

removed at a casualty clearing station. The wound was in good condition. Four days after entry he was taken suddenly ill with fever, headache and pains across the chest. By November 14 he had developed a cough, coryza and mild laryngitis. The lungs were negative. A blood culture made November 15 was negative. On November 16 the patient was very cyanotic, had increased respirations and raised purulent sputum. The lungs showed no dulness anteriorly. Posteriorly there was impaired resonance over both sides, with diminished breathing and moist rales at both bases. There was no bronchial breathing. A second blood culture was negative. On November 17 there was bronchial breathing high in the left axilla and increased voice sounds. At the left base posteriorly there were many moist rales. On November 18 a third blood culture was negative. On November 19 the chest showed moderate general dulness over both sides posteriorly, more marked

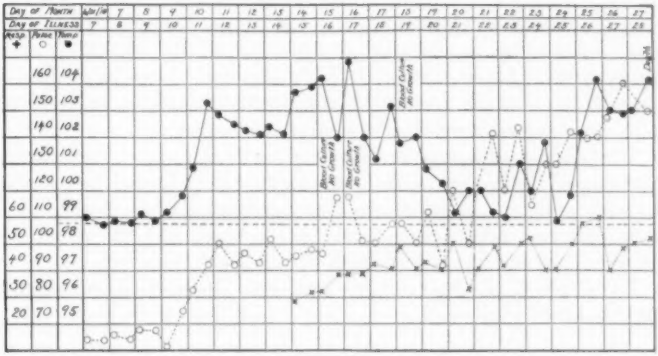

CHART IV.

on the left. There were moist rales from the apices to the bases, but no bronchial breathing. The sputum was grass-green-colored pus containing the bacillus of influenza. On November 20 the temperature recorded was normal, but the respirations were still 50 and pulse 120. The laryngitis had increased and the chest examination showed scattered moist rales but no bronchial breathing. By November 25 the man was extremely prostrated, very cyanotic, delirious and restless. There were signs of consolidation over the entire right lower lobe and bronchial breathing in the left axilla. Death occurred three days later.

Necropsy examination showed an extensive bronchopneumonia throughout both lungs. The lesions were numerous. The process apparently was many days old, since the areas immediately around the bronchioles were gray, but a more recent extension had effected almost complete consolidation in certain areas. There was no pleurisy.

CLINICAL SUMMARY. The cases of lobar pneumonia therefore were distinguished clinically from those having bronchopneumonia by the high even temperature curve, blood-tinged mucoid sputum, evidence of consolidation in one or more lobes early in the disease, pleurisy and by a shorter clinical course. The cases of bronchopneumonia showed fluctuating temperature curves produced a purulent sputum, developed indefinite or variable signs in the lungs, usually without pleurisy, and had a longer clinical course.

BACTERIOLOGY. The main bacteriological study of the cases was confined to blood cultures. The results are shown in Table I.

TABLE I.—BLOOD CULTURES IN REFERENCE TO DISEASE.

	Number positive.	Number negative.	Per cent. positive.	Per cent. negative.
Lobar pneumonia	13	9	59	41
Bronchopneumonia	0	11	0	100

It is noteworthy that 59 per cent. of 22 cases of lobar pneumonia had a septicemia in contrast to the negative findings in all of 11 cases of bronchopneumonia. This difference in the two types of cases is emphasized because it suggests a distinctive etiology for each type and confirms the clinical classification.

That the pneumococcus septicemia was not due to an agonal invasion of the blood stream is shown by the following facts: One positive culture was obtained fourteen hours before death, three were obtained twenty-four hours before death and the remainder between two and five days before death.

The types of pneumococcus which were found in blood cultures are shown in Table II.

TABLE II.—TYPE OF PNEUMOCOCCUS IN BLOOD CULTURES.

	Type I.	Type II.	Type IV.
Number of cases	1	11	1

In 7 additional cases of lobar pneumonia the type of pneumococcus was determined from the sputum by Avery's method or from cultures obtained by lung puncture. They showed 4 instances of pneumococcus Type II and 3 of pneumococcus Type IV. In 20 cases of lobar pneumonia, therefore, the types of pneumococcus obtained were: Type I, 1 case; Type II, 15 cases; Type IV, 4 cases. The high incidence of Type II is not explained.

In 14 cases of bronchopneumonia, on the other hand, cultures of the sputum contained pneumococcus only twice (pneumococcus Type I once and Type IV once), despite repeated attempts to grow the organism in other cases.

In this connection it should be mentioned that the bacillus of influenza was seen in films from the sputum of a few cases of the

lobar pneumonia group in addition to the pneumococcus. In the bronchopneumonia cases, however, the bacillus of influenza was always found in large numbers and the pneumococcus was either found rarely or not recognized at all.

MORTALITY STATISTICS. The total mortality of approximately 70 per cent. in each group shown in Table III indicates the severity of the pneumonia under consideration.

TABLE III.—MORTALITY WITH REFERENCE TO DISEASE.

	Living.		Dying.	
	Number.	Per cent.	Number.	Per cent.
Lobar pneumonia	8	32.0	17	68.0
Bronchopneumonia	4	28.5	10	71.5

This high rate for the series resulted in part fron the plan of selecting the cases for isolation that were most gravely ill. Moreover, as the mortality in both types of pneumonia was nearly the same, these observations suggest that the primary epidemic disease preceding the pneumonia altered the threshold of resistance to any secondary invaders to a considerable degree.

TABLE IV.—MORTALITY WITH REFERENCE TO NATIONALITY.

	Lobar pneumonia.					Bronchopneumonia.				
	Total cases.	Living.	Per cent.	Dying.	Per cent.	Total cases.	Living.	Per cent.	Dying.	Per cent.
British .	10	5	50	5	50	4	2	50	2	50
American .	15	3	20	12	80	10	2	20	8	80

Table IV shows that of the 14 British patients, 10, or 71.5 per cent., had lobar pneumonia, and 4, or 28.5 per cent., had bronchopneumonia. Of the 10 cases of lobar pneumonia 5 died, a mortality of 50 per cent.; and of the 4 cases of bronchopneumonia, 2 died, a mortality of 50 per cent. Of the 25 American patients, 15, or 60 per cent., had lobar pneumonia, and 10, or 40 per cent., had bronchopneumonia. Of the 15 patients having lobar pneumonia, 12 died, a mortality of 80 per cent., while of the 10 patients having bronchopneumonia, 8 died, a mortality of 80 per cent. In the total series, therefore, lobar pneumonia due to pneumococcus infection occurred with about the same frequency in both nationalities, while the mortality for both lobar and bronchopneumonia was 30 per cent. greater for the American patients than for the British.

The mortality in the cases of lobar pneumonia having positive and negative blood cultures is shown in Table V.

TABLE V.—MORTALITY WITH REFERENCE TO POSITIVE BLOOD CULTURES.

	Of cases with positive cultures.		Of cases with negative cultures.	
	Number.	Per cent.	Number.	Per cent.
Living	1	7.7	6	66
Dying	12	92.3	3	33

Of 13 cases with pneumococcus septicemia 12 died, while of 9 cases with negative blood cultures 6 survived. The fatal outcome of the cases having positive blood cultures, particularly pneumococcus Type II, is in accord with experiences of other observers.

PATHOLOGY. *Pathological Findings.* The gross appearance of the pneumonic lungs suggested a division into the following groups:

1. Pure bronchopneumonia: The lesions were discrete, even in an advanced stage. Between the lesions the lung tissue was emphysematous. Pleurisy was not often concurrent.

The individual lesion commonly began as a small hemorrhagic area about an inflamed bronchiole. As it grew in size fibrin was added and the lesion projected slightly above the surface, becoming easily palpable. The leukocytes increased and it became more gray. The final stage was from 1 to 2 mm. to 8 or 9 cm. in diameter, with a well-defined margin. The cut edges of the bronchi usually appeared thickened and projected sharply above the surface. Occasionally there was softening in the center of the nodule.

2. Rapidly Spreading Bronchopneumonia: The patches were large and ill-defined, often becoming confluent. In an early stage the lesion appeared as a large area having a dark red, "beefy" look, feeling smooth and non-granular. Even when the whole lobe was involved by the confluence of patches it did not have the massive appearance of a true lobar pneumonia, and a lumpy feeling was evident on palpation. Often small areas containing air or reddish fluid were found.

Usually there was no pleurisy in these cases. If present, it was without appreciable exudate. Two cases in our series were classified as of this type.

3. Pure Lobar Pneumonia: In these cases the lungs were atypical. They were large, massive and evenly firm on palpation. In distinction from the two previous types there was almost invariably a marked fibrinopurulent pleurisy over the affected lobe. This pleural lesion was lacking in the same case over lobes which were not involved in the lobar process, even though they presented marked bronchopneumonia.

The cut surface showed even consolidation, some in the stage of red hepatization, some in the gray stage.

4. In a certain number of cases the lobar pneumonias gave evidence of a previous bronchopneumonic process in the same lobe. Immediately about the bronchi there were areas showing older, harder lesions of a red or gray color.

5. In many cases the lobes not involved in the lobar process showed a bronchopneumonic process. It seemed probable that in some of these cases there was also a bronchopneumonic process in the lobe with lobar pneumonia, which was obscured by the lobar consolidation.

6. In 3 cases a lobe or lobes were edematous, with red fluid and airless, but not consolidated.

Associated Processes: Marked bronchitis was nearly always present. Pericarditis was noted in 3 cases. In 1 case it was of the dry adhesive type and concurrent with bronchopneumonia. In the 2 other cases it was purulent and associated with lobar pneumonia. The pericardial exudate contained a pure culture of pneumococcus in each of the 2 latter cases. In 1 case the pneumococcus on being typed proved to be Type II, which was the same as in the blood culture and lung culture.

Empyema: In 4 cases empyema occurred with lobar pneumonia, in 1 case with bronchopneumonia. Marked collapse occurred only in the bronchopneumonic case.

Pleural Exudate: In 6 cases, all lobar pneumonia, there was excess of pleural fluid, slightly cloudy and reddish brown.

SUMMARY. 1. A series of 39 cases of pneumonia complicating "influenza" is reported, in which lobar pneumonia occurred in 25, or 64 per cent., and bronchopneumonia in 14, or 36 per cent. The cases were selected, on account of their apparent severity, from many cases that were admitted to the hospital at the same time.

2. The cases of lobar pneumonia were characterized by lung signs typical of consolidation, high sustained temperature curves, blood-tinged mucoid sputum and a shorter course than the cases of bronchopneumonia.

3. The cases of bronchopneumonia showed indefinite and variable lung signs, fluctuating temperature curves, purulent sputum and tended to run a more prolonged course.

4. The total mortality of 70 per cent. was the same in both types of pneumonia, but was 30 per cent. higher for the American patients than for the British.

5. Positive blood cultures were obtained in 13 of 22 cases, 59 per cent., of lobar pneumonia. No organism except the pneumococcus was recovered, Type II occurring in 84.6 per cent. of the cases. The sputum in the cases examined microscopically contained pneumococcus, usually in large numbers, while in a few cases the bacillus of influenza was also found.

6. No positive blood cultures were obtained in 11 of 14 cases of bronchopneumonia. The sputum always contained the bacillus of

influenza in large numbers, although a few contained the pneumococcus as well.

7. The pathological picture at necropsy, in general, was that typical of lobar pneumonia in some cases, bronchopneumonia in others and combinations of both types in a few cases.

REFERENCES.

1. Horder, T.: Some Observations on the More Severe Cases of Influenza. Occurring during the Present Epidemic, Lancet, 1918, cxcv, 871.

2. Christian, H. A.: Incorrectness of Diagnosis of Death from Influenza, Jour. Am. Med. Assn., 1918, lxxi, 1565.

3. Keegan, J. J.: The Prevailing Epidemic of Influenza, Jour. Am. Med. Assn., 1918, lxxi, 1051.

4. Nuzum, J. W., Pilot, I., Stangle, F. H., and Bonar, B. E.: Pandemic Influenza and Pneumonia in a Large Civil Hospital, Jour. Am. Med. Assn., 1918, lxxi, 1562.

5. Friedlander, A., McCord, C. P., Sladen, F. J., and Wheeler, G. W.: The Epidemic of Influenza at Camp Sheridan, Jour. Am. Med. Assn., 1918, lxxi, 1652.

6. Synnott, M. J., and Clark, E.: The Influenza Epidemic at Camp Dix, Jour. Am. Med. Assn., 1918, lxxi, 1816.

7. Abrahams, A., Hallows, N., and French, H.: A Further Investigation into Influenzo-pneumococcal and Influenzo-streptococcal Septicemia, Lancet, 1919, cxcvi, 1.

8. Blanton, W. B., and Irons, E. E.: A Recent Epidemic of Acute Respiratory Infection at Camp Austin, Mich.; Preliminary Laboratory Report, Jour. Am. Med. Assn., 1918, lxxi, 1988.

9. Muir, R., and Wilson, G. H.: Observations on Influenza and its Complications, British Med. Jour., 1919, No. 3027, vol. iii.

10. Hall, J. N., Stone, M. C., and Simpson, J. C.: Epidemic of Pneumonia following Influenza at Camp Logan, Texas, Jour. Am. Med. Assn., 1918, lxxi, 1986.

11. McIntosh, J.: The Incidence of B. Influenzæ (Pfeiffer) in the Present Influenza Epidemic, Lancet, 1918, cxcv, 695.

12. Fildes, P., Baker, S. L., and Thompson, W. R.: Provisional Notes on the Pathology of the Present Epidemic, Lancet, 1918, cxcv, 697.

13. Strouse, S., and Bloch, L.: Notes on the Present Epidemic of Respiratory Disease, Jour. Am. Med. Assn., 1918, lxxi, 1568.

14. Whittingham, H. E., and Sim, C.: Some Observations on the Bacteriology and Pathology of "Influenza," Lancet, 1918, cxcv, 865.

15. Fletcher, W.: Meningococcus Bronchopneumonia in Influenza, Lancet, 1919, cxcvi, 104.

16. Avery, O. T.: Determination of Types of Pneumococcus in Lobar Pneumonia: A Rapid Cultural Method, Jour. Am. Med. Assn., 1918, lxx, 17.

REVIEWS

RULES FOR RECOVERY FROM TUBERCULOSIS. By LAWRASON BROWN, M.D. Third edition. Pp. 192. Philadelphia and New York: Lea & Febiger, 1919.

THIS book is composed of a series of short essays or papers, twenty-four in number, each dealing with an independent phase of the disease and its treatment as viewed from the patient's standpoint. Such subjects as rest, diet, climate, clothing, habits, means of infection, choice of room, with the utilization of the porch and recreation for the tuberculous patients, are taken up and described in sufficient detail to satisfy the great majority of patients' thirst for knowledge. The book was primarily written for the use of patients, but it contains so many good, practical points in the treatment of the disease, the relation of patient to physician, what the patient may do without consulting the physician, all alarming symptoms, that no physician can afford not to utilize it to the greatest extent both as for himself and for his patient. It is a book which could well be adopted by the public as a big tool in the fight against this disease. It is written in an interesting style, concise and very practical. All tuberculous patients would find it of great help in deciding many simple questions which arise daily while taking the "cure" and after their return to civilian life.

T. K.

THE MEDICAL CLINICS OF NORTH AMERICA. Volume II, Number 5, Boston No. Pp. 324; 34 illustrations and 12 diagrams. Philadelphia and London: W. B. Saunders Company, March, 1919.

THIS volume contains many interesting and instructive articles. The first comprises a series of clinics, by Dr. Henry A. Christian, upon "Cutaneous Pigmentation, Jaundice, Palpable Liver and Spleen and Ascites." Dr. Christian considers all facts with the student, and finally reaches his diagnosis by exclusion. He reviews briefly the literature upon hemochromatosis and bronze diabetes, pointing out many of the recent studies in hemochromatosis from the etiological standpoint, all of which remains somewhat a factor of doubt. The results of his case are confirmed by a postmortem

report. He also reports a case of fibrinous bronchitis, with again a brief review of the literature. He points out the great importance of a closer macroscopic study of the sputum and a gradual tendency of all men to look for everything with the microscope and not with the naked eye. The etiological factors, methods of diagnosis and finally the importance of vaccine therapy in such cases, as well as in chronic bronchitis and asthma, are considered. Dr. George R. Minot reports 4 cases of enlarged spleen, 2 of which were Banti's disease and the others a myelogenous leukemia. In the former a very brief, concise description is given, dividing the disease into its three stages and pointing out especially its chronicity. The diagnostic points are mentioned, with special reference to the blood-making organs. The differential diagnosis between this disease and Gaucher's disease, von Jaksch's anemia, hemolytic jaundice, splenic thrombosis and syphilis of the spleen is given. He advocates early splenectomy in Banti's disease. The second case gave symptoms suggestive of a peptic ulcer, and, in fact, had been previously operated upon for that disease. Radium and roentgen rays are advocated early in the treatment of myelogenous leukemia. Dr. John B. Hawes calls attention to the fact that the recent epidemic of influenza has not caused an increase of activity in a large proportion of healed or inactive cases of pulmonary tuberculosis. He shows statistics to prove that the death-rate and incidence of influenza among inactive and active tuberculous patients were not as high as in the non-pulmonary cases. He thinks that these tuberculous cases have a certain degree of immunity to influenza. He calls attention to the increase in difficulty in the diagnosis of pulmonary tuberculosis, owing to this respiratory epidemic, and warns against making a diagnosis upon insufficient clinical manifestations when there is a recent history of influenza, as a great many of the lung findings soon clear up without doing any permanent damage. Dr. Frederick T. Lord reports a case of pulmonary abscess, unknown etiology, operation and recovery. Dr. Franklin W. White's article upon "The Improvement in the Medical Treatment of Chronic Ulcer of the Stomach and Duodenum" needs special mention. He emphasizes the importance of individualizing the treatment of every case. His follow-up system, using the roentgen rays to study the ulcer anatomically, as well as the motility of the stomach, associated with the general condition of the patient, seems to be the best way of formulating an opinion as to the direct progress of all ulcer cases. The diagrams showing improvement in duodenal cap deformity with marked clinical improvement are very interesting. In an article upon "Lessons of the War in the Field of Cardiac Disease," Dr. F. W. Peabody calls attention to three distinct types of heart disease, which have a large bearing upon civilian cases. He calls attention especially to the functional cardiac or effort syndrome cases—cases with definite endocardial lesions without any clinical

manifestations, and lastly cases with systolic apical murmurs without evidence of any cardiac hypertrophy. These cases, however, have a definite history of severe attacks of tonsillitis or acute rheumatic fever. He believes these are cases of early organic heart disease, and the method of treatment is directed toward cleaning up all focal infections. T. K.

THE MEDICAL CLINICS OF NORTH AMERICA. Volume II, Number 6, Baltimore No. Pp. 297; 7 illustrations. Philadelphia and London: W. B. Saunders Company, May, 1919.

DR. LEWELLYS F. BARKER reports a case of funicular myelitis with an early blood picture of only a secondary anemia. He points out the frequent nervous lesions associated with the anemias. A careful differential diagnosis between parasyphilis, multiple sclerosis and transverse myelitis is considered. The etiology and pathology with reference to the recent literature is also added. Dr. Julius Friedenwald gives his personal experiences in the treatment of ulcer of the stomach. He gives a brief review of the various medical treatments used in peptic ulcer, including the Leube cure; the Lenhartz cure; the Sippy cure; comparative results of the various forms of treatment; Einhorn's duodenal alimentation; brief discussion of the surgical treatment. The advantage of pyloroplasty over gastro-enterostomy, as compared upon a similar 100 cases, is given with from 8 to 11 per cent. better immediate and final results in favor of the pyloroplasty. Medically, the Sippy cure has been the one adopted in his clinic. It is described somewhat in detail. The follow-up system with the roentgen-ray studies is called attention to as the only sure way of judging the healing process of the ulcer. A diet list used following the ulcer treatment as well as the one comprising the actual treatment is appended. In another short article he reports 41 cases of true achylia gastrica and 37 spurious achylias as determined by the fractional method. Some of the true achylias occurred in chronic gastritis, gastric ulcer, gastric carcinoma, pernicious anemia, cholelithiasis, syphilis of the stomach, pulmonary tuberculosis, and, after an operation, where a pylorectomy and gastro-enterostomy had been done. He contrasts the low total acid, free HCl curve with the hypermotility in the true achylias and that of the chronic gastritis cases wherein which the total acid curve is higher, associated with a large quantity of mucus and oftentimes a delayed motility. Dr. Gordon Wilson lays special stress upon the necessity of convincing one's patient that he has the disease in the treatment of pulmonary tuberculosis. Thinking that this is the first fundamental and to help the patient to realize that tuberculosis is essentially a chronic disease, passing through periods of apparent

quiescence without symptoms. The remainder of the treatment must be entirely individualized according to the patient's means, social status, etc. The climate will not cure the disease, but the life which the patient leads in that climate is the most important.

Pneumococcus sepsis in contradistinction to local and focal infection, with full discussion of symptoms, prognosis and treatment, is described by Dr. Paul W. Clough. He believes that more urgent search for positive blood cultures in pneumonia is needed. He also thinks that the cases which get well give a positive culture early, later becoming sterile, while in the malignant cases the opposite is true. Blood cultures showing more than 5 colonies to the cubic centimeter of blood gives a less favorable prognosis. The method of invasion of the blood stream is described. Serum treatment in large doses in Type I infections only is advocated. The literature on the subject is partially reviewed. Gastro-intestinal disturbances in metabolic diseases and diseases of the ductless glands are set forth by Dr. John H. King. The role of diet in the treatment of digestive disorders, with a description of irritation and non-irritating foods as used in various disorders, is given in detail by Dr. E. H. Gaither. Dr. Louis Hamman describes diabetes with reference to the latest literature and complete physiological processes. T. K.

SURGICAL TREATMENT. By JAMES PETER WARBASSE, Surgeon to the Wyckoff Heights Hospital, Brooklyn, New York. Volume III. Pp. 861; 865 illustrations. Philadelphia and London: W. B. Saunders Company, 1919.

IN this third and final volume the author maintains the standard set in its predecessors. It continues abdominal surgery through herniæ, affections of the liver and gall-bladder, male genito-urinary and female genital organs. The affections of the upper and lower extremities, not included in the other two volumes, plastic and cosmetic surgery and some phases of surgery not previously considered, complete the volume. Among the last a chapter on electricity and radiation and another on the economics of surgical treatment deserve special attention. An appendix of twenty pages was apparently added to include material after the chapter to which it properly belongs had been completed and gone to print, indicating the desire of the author to include all available valuable new facts.

A survey of the three volumes impresses one with their general excellence. The dominating feature seems to lie in the number and quality of its illustrations, and the greatest value of these is seen in the diagrammatic simplicity with which the essential phases are emphasized. As to the frequency with which they are employed it is not uncommon to find two and three on one page and some-

times five. The relative frequency of illustrations to text increases with each succeeding volume. For a total of 2508 pages of text in the three volumes there are 2324 illustrations, all of high-grade excellence. While the text is absolutely necessary to a book and the illustrations are not, yet the greatest modern need is more good illustrations.

The great fault of the old text-book and later the system was that the subject was too big for the space allowed, so that the active surgeon did not find his particular need in an emergency supplied or not with sufficient detail. The exclusion of almost all except therapeutics is an important step in the direction of overcoming this defect in the field in which the immediate demand for special surgical knowledge is most frequent. Thus we find 42 pages devoted to the treatment of affections of the rectum and anus and 184 pages to that of the male genito-urinary organs, the tendency being toward the special treatise or monograph type of treatment of each surgical field.

This one-man system has fully justified and made a place for itself among the standard works on general surgery. The long accepted method of assigning each of the various parts to an expert in that particular field of surgery is here set aside for one in which an expert selects from the literature the best in every field and resets it in easily digestible form for our ready use. It has already proved its value by the popularity it has won by its first two volumes.

THE BLIND: THEIR CONDITION AND THE WORK BEING DONE FOR THEM IN THE UNITED STATES. By HARRY BEST, Ph.D. Pp. 763. New York: The Macmillan Company.

THOSE who are familiar with the author's book on *The Deaf* need no description of his thoroughness and well-founded deductions. The present volume is essentially a book of reference on conditions of the blind in the United States. The first part takes up the general condition of the blind, their health, their legal treatment and economic condition and the cost of blindness to the individual and the State. The importance of the subject to the State seems apparent when the total cost of the blind in the United States is realized to be nearly $31,000,000.

The second part of the book considers the possibilities of the prevention of blindness due to heredity, to disease and to accident. The statement is made that, on the whole, blindness is decreasing somewhat and that a still further decrease should follow.

The third part is concerned with the education of blind children. It is largely historical. Then follow chapters dealing with intellectual provision for the adult blind and material provision for the blind, their work in the industries and the attitude of Workmen

Compensation laws toward the blind. Further chapters deal with organizations interested in the blind and provisions of the National Government for persons blinded in war.

The work is encyclopedic in character and the author is to be praised for compiling in one volume so much valuable data. The book will prove invaluable to anyone at all interested in the blind.

C. N. S.

PYE'S SURGICAL HANDICRAFT. By W. H. CLAYTON-GREENE, B.A., M.B., B.C. (Camb.), F.R.C.S. (Eng.); Surgeon to St. Mary's Hospital. Eighth edition. Pp. 639; 362 illustrations and 11 plates. New York: William Wood & Co., 1919.

WALTER PYE wrote the first edition of this book thirty-five years ago, describing "the details of surgical work as it appears from the point of view of house surgeons and dressers in surgical wards." In this the eighth edition it has been fully revised and new illustrations and text have been added. Some chapters have been rewritten, particularly the one treating of war wounds and the control of sepsis. The author has been guided by the works of Sir Robert Jones in advising treatment of orthopedic cases. In addition to measures applicable in general surgical cases, there are chapters devoted to the surgical specialties written by specialists. Among the miscellaneous subjects included in the work are a brief but excellent chapter on the treatment of the teeth, treatment of poisoning, of drowning, and the use of the roentgen-rays. The newer methods of treatment that properly belong within the scope of the book are included in this edition, but here where detail is needed it is somewhat lacking.

G. M. L.

OUTLINE OF GENITO-URINARY SURGERY. By GEORGE GILBERT SMITH, M.D., Genito-urinary Surgeon to Out-Patients, Massachusetts General Hospital; Member of American Association of Genito-urinary Surgeons and the American Urological Association, etc. Pp. 300; 74 illustrations. Philadelphia and London: W. B. Saunders Company, 1919.

THIS work is one that should appeal strongly to the general practitioner, in that it draws a sharp dividing line between the diagnostic work which can be done by the general practitioner and that which must be referred to the urologist.

The text is well written and all superfluous description is wisely eliminated. The statements of the author are those which have their foundation in practical experience. At the end of each chapter a bibliography of the more important articles is appended.

The diseases of the male genitalia and urinary organs are discussed in a systematic way and in as complete a manner as possible within the scope of the work.

The chapters devoted to the diseases of the bladder and kidney are particularly good, in that attention is directed to the serious significance of the symptoms hematuria and pyuria and the necessity of determining accurately and quickly the underlying pathology.

W. H. M.

TRANSACTIONS OF THE SECTION ON GENITO-URINARY DISEASES OF THE AMERICAN MEDICAL ASSOCIATION. Sixty-ninth Annual Session, June, 1918. Pp. 300; illustrated. Chicago: Am. Med. Assn. Press, 1918.

THE volume is reprinted from the *Journal of the American Medical Association*, and includes a list of officers of the Section, the Proceedings of the Section and the papers presented, together with abstracts of the discussion. The illustrations are particularly well reproduced. The papers, seventeen in all, characterize the advancing scientific spirit of modern urology.

G. M. L.

TRANSACTIONS OF THE ASSOCIATION OF AMERICAN PHYSICIANS. Thirty-third Session, May 7 and 8, 1918. Vol. XXXIII.

THE transactions of such a notable body of physicians are always held in great respect, and the review of papers read at their sessions is a privilege. The present volume contains thirty-six papers on as many different subjects, including the address of the President, Dr. Francis H. Williams, on the "Importance of Bedside Instruction in the Teaching of Therapeutics." To select among the other papers those deserving special mention is obviously unfair, because what would appeal to one reviewer possibly would not to another. Nevertheless, of unusual interest are the following papers: "Results from the Intravenous Use of Salvarsan in Syphilis of the Nervous System," by B. Sachs, M.D.; "Acute Pancreatitis in Typhoid Fever," by Thomas McCrae, M.D.; "The Intravenous Serum Treatment of Epidemic Cerebrospinal Meningitis," by W. W. Herrick, M.D.; the "Rat and Infantile Paralysis: a Theory," by Mark W. Richardson, M.D.; "A Case of Bulimia," by George Dock, M.D.; "Pneumonia at a Base Hospital," by Rufus Cole, M.D., and W. G. MacCallum, M.D.; "The Thyroid Hormone and its Relation to Metabolism," by E. C. Kendall, Ph.D.; "Chronic Septicemic Endocarditis, with Splenomegaly: Treatment by Splenectomy," by David Riesman, M.D.

C. N. S.

PROGRESS
OF
MEDICAL SCIENCE

MEDICINE

UNDER THE CHARGE OF

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The Gastric Response to Foods. II. A Fractional Study of the Coagulation of Milk in the Human Stomach.—For their experiments, BERGEIM, EVVARD et al. (*Am. Jour. Physiol.*, 1919, xlviii, 411) were fortunate enough to secure the services of a man who could regurgitate the contents of his stomach at will at any desired stage of digestion. Two kinds of studies were made: one in which small samples of the stomach contents were regurgitated at intervals throughout the curdling period of the milk, the other in which the stomach was completely emptied half an hour after the ingestion of a pint of milk. The experiments were usually made before breakfast on an empty stomach. The following is a brief summary of their findings: Milk drunk rapidly (500 c.c. in ten to thirty seconds) left the stomach more rapidly and produced a smaller curd mass than milk drunk slowly (five to ten minutes). Curding took place very rapidly in the stomach, irrespective of temperature; there was a slight slowing in the coagulation rate when the milk was considerably below body temperature. Raw whole milk formed firm, "rubbery," white curds, the maximum formation taking place about one hour after drinking. Milk which had been boiled five minutes gave small, soft, yellow curds, which left the stomach more rapidly and were much more digestible than the tough curds resulting from raw milk. Previous experiments have shown that the boiling of milk for five minutes does not materially alter its nutritive value or growth-promoting properties, but may lower its antiscorbutic value. Pasteurization was not as effective as boiling, but the curds were smaller

than from whole raw milk. A mixture of 80 per cent. boiled whole milk and 20 per cent. raw whole milk gave curds very similar to those of straight raw, whole milk. Raw skimmed milk formed particularly tough, hard curds. These formed very quickly (one-half minute) and within five minutes coalesced into masses as large as a man's thumb. They were difficult to regurgitate and the regurgitator complained of a "heavy" feeling in the stomach. When the skimmed milk was boiled the curds were smaller and softer than those of the raw skimmed milk, but not as small and soft as those of the boiled whole milk. As the skimmed milk is relatively poor in fat it is apparent that the fat content is an important factor in determining the character of the curd. The higher the fat concentration in the milk used the smaller and softer the curds and the longer it remained in the stomach. Two and a half hours after the ingestion of a pint of 40 per cent. cream, 475 c.c. were regurgitated. This rich cream caused a heavy, uncomfortable feeling in the stomach of the subject. The drinking of water before the ingestion of the milk had no material effect except that the curds were somewhat softer. The addition of sodium bicarbonate caused the formation of smaller and softer curds than those produced in similar milk without bicarbonate. There was definite curd formation in five minutes, although the stomach contents remained alkaline for thirty minutes. The bicarbonate was not as effective as boiling in producing small, soft curds.

Observations on Hyperglycemia and Glycosuria.—In his Croomian Lecture, HAMBURGER (*British Med. Jour.*, March 8, 1919, p. 267) gives his answer to two questions which have long puzzled the pathologist and the clinician: (1) Why does sugar, which is always present in the blood, rarely if ever appear in the urine of normal individuals, and (2) why does sugar appear in the urine when its presence in the blood exceeds a certain limit? Hamburger discards as untenable all the theories which have been offered to explain glycosuria except that of Lepine, who believes that sugar is present in the plasma as a colloidal compound—a compound of non-colloidal glucose with a substance present in the plasma. The glomerular epithelium is not permeable to this colloidal compound, but if the quantity of glucose becomes so great that the amount of the other substance is insufficient to bind it all, free glucose will circulate in the blood plasma, pass through the glomerular epithelium and appear in the urine. Hamburger's first task, in attempting to prove Lepine's theory, was to determine whether or not the kidney allowed free glucose to pass through. He selected frogs for his experimental animals, for in these it is possible to perfuse only the glomeruli. For the perfusion he used Ringer's solution, containing NaCl (0.7 per cent.), $NaHCO_3$ (0.02 per cent.), KCl (0.01 per cent.), CaCl (0.0075 per cent.). To this he added definite amounts of sugar. From his experiments he concludes that the glomerular membrane has the power of retaining free glucose, and this power is governed by the chemical composition of the perfusion fluid. When Ringer's solution containing 0.1 per cent. glucose is perfused through the kidney a "urine" containing 0.07 per cent. sugar is excreted and 0.03 per cent. is retained. If the percentage of KCl or $CaCl_2$ be changed in either direction the glomerular epithelium allows all the sugar to pass and none is retained.

However, by varying the quantities of potassium and calcium a point is reached at which they "balance" each other and the retentive power of the kidney is restored. If the concentration of $NaHCO_3$ in the Ringer's solution be raised from 0.02 per cent. to 0.285 per cent. (the quantity actually present in frog's serum) then the kidney retains more than 0.03 per cent., and the "urine" becomes wholly sugar-free. These results are of great importance, for they indicate that the urine of normal individuals is kept free from sugar by a nicely regulated permeability of the renal cells and not by a colloidal binding of the blood sugar. When fructose or lactose and dextrose occur in the perfusion fluid only the fructose or the lactose is let through. The sugars are separated as by a filter. This is a new form of permeability, where cells under physiological conditions though permeable to salts are yet impermeable to glucose, which like these is also a crystalloid. The size of the molecule is not the cause of this, as lactose, which possesses a much larger molecule than dextrose, passes through the glomerular membrane; it appears, therefore, that the structure of the glucose molecule must be considered responsible. This is interesting as a physiological illustration of the doctrine of stereo-isomerism. Hamburger's experiments throw light on the customary measures used in the treatment of advanced diabetes. In acidosis the alkali and the concentration of HCO_3 ions in the blood are diminished. In other words the concentration of $NaHCO_3$ in the blood has become smaller and the human kidney is in the same condition as the frog's kidney, through which a liquid which contains too little $NaHCO_3$ is perfused, and, like the latter, is unable to hold back all the sugar. Furthermore, in diabetes the quantity of K in the urine is greater than in normal persons. This loss of K by the blood plasma must be restored, for unless the concentration of $NaHCO_3$ is normal (0.285 per cent.) the concentration of K may not vary between wide limits without increasing the permeability of the kidney to sugar. Hamburger suggests that it would be well to give diabetic patients some $KHCO_3$ in addition to the customary $NaHCO_3$. The oatmeal cure and the potato cure may owe their efficacy in part to the relatively large amounts of K which are found in these foods. The following hypothesis is offered to explain the relation between hyperglycemia and glycosuria: As long as the concentration of $NaHCO_3$ in the blood plasma is normal, even a moderate hyperglycemia will cause no glycosuria. If, however, the $NaHCO_3$ concentration is diminished the glomerular epithelium becomes sensitive to the proportions of Ca and K in the blood plasma and glycosuria occurs. A deficiency in the K must be met artificially, but the excretion of sugar can be prevented to a large extent by increasing the concentration of the $NaHCO_3$.

Studies in the Mechanism of Absorption from the Intestine.—*I. The Colon. A Contribution to the One-sided Permeability of the Intestinal Wall to Chlorides.* GOLDSCHMIDT and DAYTON (*Am. Jour. Physiol.*, 1919, xlviii, No. 4) conclude that the colon is not characterized by a one-sided permeability, for when distilled water or very dilute solutions of sodium chloride are introduced into the large intestine, chlorides diffuse from the blood into the intestinal contents. *II. The Colon. On the Passage of Fluid in Two Directions through the*

Intestinal Wall. When hypertonic solutions of sodium chloride are introduced into the colon they attract fluid into the intestine and at the same time chlorides pass into the blood. *III. The Colon. The Osmotic Pressure Equilibrium between the Intestinal Contents and the Blood.* Hypertonic and hypotonic solutions of sodium chloride come into partial pressure equilibrium with the blood and there appears to be an attempt at total osmotic pressure equilibrium between the colon contents and the blood. *IV. The Colon. The Behavior of Sodium and Magnesium Sulphate Solutions.* When hypotonic solutions of sodium sulphate are introduced into the colon, water is absorbed until the contents become nearly iso-osmotic with the blood. Hypertonic solutions attract water and the volume increases while the concentration decreases and becomes nearly isotonic with the blood. Solutions nearly iso-osmotic with the blood show little change in volume. There is therefore free passage of water with practically no diffusion (absorption) of sulphate, and the colon behaves toward solutions of sodium sulphate essentially like a semipermeable membrane. Magnesium sulphate shows even less absorption than sodium sulphate. The non-absorption of these salts from the colon emphasizes the important role played by the large intestine in saline catharsis. Providing the cathartic salt reaches the colon in sufficient amount, so that by osmotic interchange between the blood and colon enough fluid is introduced to increase the bulk and fluidity of the colon contents, catharsis will be assured. This might occur independent of the volume of fluid reaching the colon from the small intestine. The determining factor will be the amount of the salt which reaches the large intestine, and inasmuch as little is absorbed, this will be cumulative. Furthermore, once enough of an isotonic or hypertonic solution has reached the large intestine to increase the bulk and fluidity of the colon contents, catharsis is assured, as they have shown that but a small quantity of the salt is absorbed in ten hours.

PEDIATRICS

UNDER THE CHARGE OF

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Hypophyseal Dystrophy in Hydrocephalus.—STRAUCH (*Jour. Am. Med. Assn.*, June 14, 1919, No. 24, vol. lxxii) reports a case. Certain features of the history of this case suggest a part of the clinical picture of hypophyseal dystrophy. These manifestations must be distinguished from those of internal hydrocephalus. The rapid development of a deposit with eunuchoid localizations, and the high tolerance for glucose indicated constitutional metabolic changes such as are observed in functional deficiency of the posterior lobe of the hypophysis. The delicate skin, the lack of perspiration and the arterial hypertension pointed to this organ. On the other hand the abnormal increase of the size of the skull, with thinning of the region of the anterior fontanelle,

and the marked remissions and exacerbations of the nervous disturbances left no doubt about the existence of hydrocephalus internus. Its causative agent could not be ascertained clinically beyond dispute. The differential diagnosis considered an "idiopathic" hydrocephalus, or rather the exacerbation of a previous hydrops ventriculorum and a possible distant obstructive lesion without focal manifestations. The presence of the hydrocephalus gave satisfactory explanation of dystrophy, through the assumption of a pressure lesion of the hypophyseal apparatus, and with the absence of optic nerve disturbance, even as late as the time of admission, militated against the assumption of a tumor of the hypophysis itself. The radiological findings were in accord with this, the shallow dish-like dilatation of the entrance of the sella turcica having been merely a partial manifestation of the cranial changes that were due to general increased intracranial tension. Polyuria and polydipsia, which were so marked in this case, have not been infrequently noted by other authors as a temporary symptom in hypophyseal dystrophy, and in a few cases a serious diabetes insipidus was a predominant feature. It has also been encountered for a period as an after-effect of surgical operations in the hypophyseal region, even of simple sellar decompression. The occurrence of polyuria in bloodless, mechanical or chemical irritations of the hypophysis, and the well-established fact of the diuretic effect of the extract of the nervous lobe, combine to indicate the cause of this clinical symptom to be an increased secretion, resulting from irritative conditions such as pressure, inflammation and the like. The state of initial stimulation of the posterior lobe in this case may be assumed to be preceding its irritation or destruction. The persistance of polydipsia during the period of well-developed adiposity, the latter indicative of hypofunction, cannot be explained on a different basis. It may be considered a habit formed during the illness. Several circumstances indicate this; the excessive drinking of water had entirely lost its initial compelling character and its degree; it became easily controlled by persuasion, was subject to occasion and absent during the stay in the hospital. On the other hand marked polyuria has been observed also in tumors (gumma) in the vicinity of the hypophysis, and in various affections of the brain stem (chiasma, thalmic region, etc.); it likewise has been produced by irritation of certain parts of the medulla oblongata. The polyphagia repeatedly mentioned in the literature has been attributed to posterior lobe insufficiency. If the rapid growth of the patient, the advanced development of the labia majora, and the growth of hair on the labia majora is interpreted in the light of present preponderant evidence of the function of the parts of the hypophysis, there may be possibly here an example of activation and hyperfunction of the anterior lobe, combined with posterior lobe insufficiency. The disturbance of micturition and defecation is only explained in the large hydrocephalic effusion, with pressure lesion of the corresponding cerebral districts.

Bacillus Tuberculosis in the Tonsils of Children Clinically Non-tuberculous. — AUSTIN (*Am. Jour. Dis. Children*, July, 1919, No. 1, vol. xviii) reviews the literature, which shows little written on the subject. Latham reported 45 cases, 7 of which showed tuberculosis. Friedman reported 147 cases with 17 showing tuberculosis. Kingsford

reported 17 cases with 7 cases of tuberculosis. Hess reported 13 cases with 1 case of tuberculosis. Mitchell reported 100 cases in which the tonsils were removed at operation from patients with tuberculous cervical glands; 44 of these had tuberculosis of the tonsils. He also reported 100 cases without signs of tuberculosis, in which examination of the tonsil showed 13 cases positive for tuberculosis. Austin began his work by developing a method of inoculating guinea-pigs with tonsillar tissue, which would not produce a high mortality, and would not involve destruction of the tubercle bacillus. The tonsils were removed from five healthy children and on removal were placed in sterile test-tubes. They were then washed thoroughly and placed in a sterile glass mortar, and minced into fine pieces with pointed scissors. Then the material was ground with a glass pestle, observing all the while aseptic precautions. A small amount of physiological sodium chloride solution was found to facilitate the grinding. The ground material after being thoroughly mixed was divided into two parts. To one was added a small amount of growth from a culture of tubercle bacillus, which was mixed in thoroughly. Each of the two parts was next mixed with its volume of antiformin, and placed in a centrifuge tube in the incubator at 37° C. for three hours or less. The antiformin was removed by successive washings in the centrifuge. About 1.5 c.c. were injected into the crushed lymph glands in the left groin of guinea-pigs of about 300 grams weight. Of the guinea-pigs injected with the material to which no culture of tubercle bacillus has been added all but one lived for seven weeks. They were then killed and no evidence of tuberculosis was found at autopsy. Of the animal receiving material to which culture of tubercle bacillus had been added, all but one developed firm large glands in the left groin in from two to five weeks. They were killed and revealed tuberculous lesions in these glands, in the spleen in the liver and elsewhere. This method was then applied to the excised tonsils of forty-five children. Fifteen were from two and a half years and thirty from five to twelve years of age. All were well developed and nourished. There was no personal history of tuberculosis. Cervical lymph glands were enlarged in twenty-one. In none was there any evidence of tuberculosis on physical examination. Only one of this series gave a positive test for tuberculosis, and this was of the human type. This case had no family history of tuberculosis, although two other cases had a history of tuberculosis in their families. The author states that although tuberculosis of the tonsils in children is not rare, most of the cases occur where there are tuberculous lesions elsewhere in the body, especially in the cervical lymph glands.

Antiscorbutic Properties of Fruits (an Experimental Study of Dried Orange Juice).—Givens and McClugage (*Am. Jour. Dis. Children*, July 19, 1919, No. 1, vol. xviii) previously reported the persistence of the antiscorbutic value of dried cabbages and tomatoes. Orange juice was dried by two methods and both products were fed to healthy guinea-pigs. They show this animal scurvy just as the human does, and is especially adapted for the experimental study of the antiscorbutic vitamin. In these experiments it was shown that experimental scurvy could be averted or cured by the use of a small amount of orange juice. Orange juice can be dried so that it retains a con-

siderable amount of antiscorbutic vitamin. The best method of drying is the one in which the temperature of drying is not unduly high, and the duration of the drying is very short. Orange juice stored for three months was active. The authors suggest the value of this antiscorbutic product where the price of the fresh fruit is prohibitive or where it is not to be had as among the poor of our cities. In addition there is a definite value on polar expeditions, in the navy and in the army during war.

The Acidotic State of Normal Newborns.—SEHAM (*Am. Jour. Dis. Children*, July, 1919, No. 1, vol. xviii) made 150 determinations on 50 babies whose ages ranged from one hour to thirty-two weeks. He studied among other things the effect of food and exercise upon the observations. He found that alveolar carbon dioxide tension is a practical index of acidosis. Fifty cubic centimeters of air in the bag over a period of thirty seconds for breathings gave the most constant results. The modification of the Plesch-Higgins method of collecting air with the use of the pulmotor mask is the most practical way of collecting air from newborn babies. He was not able to establish a lower carbon dioxide tension, which is indicative of the so-called "acidotic state." The ingestion of food and starvation and muscular exercise under these conditions had not demonstrable effect in the alveolar carbon dioxide tension. The urine of the normal newborn infant is nearly always acid. It takes on the average 1.7 gm. of sodium bicarbonate to turn the urine from acid to alkaline, giving 0.16 gm. every two hours by mouth. His results with the alkali tolerance test for normal newborn babies do not indicate an acidosis. He found that practically no acetone is found in the urine of normal newborns.

Protein Milk Powder.—BROWN and MACLACHLAN (*Am. Jour. Dis. Children*) give the results of their observation. It is indicated in severe cases of diarrhea, which do not respond to the elimination of carbohydrate in the usual milk mixture, and also in practically all cases of intoxication, and infectious diarrhea, and in many cases of dyspepsia in breast-fed infants. It was also found to be very useful in chronic intestinal indigestion in older children. Last but not least is its employment most essential in the preliminary corrective stage of atrophy or marasmus. It is used for three or four weeks and the authors were able to keep children on protein milk, or protein milk and starch or dextrimaltose for several months with substantial gain in weight and general development. To make protein milk a quart of certified raw milk is used. To this is added two teaspoonfuls of essence of pepsin. It is warmed to 140° F. and kept at this temperature for ten minutes. Then it is allowed to stand at room temperature for a half hour. The curd is then separated from the whey and placed in a cheesecloth bag and allowed to drip in the refrigerator overnight. The curd is then worked through a fine sieve and at the same time there is added one pint of a low acid buttermilk and one pint of water or enough water to make a quart of finished protein milk, to which is added one grain of saccharin. The buttermilk is made from fat-free milk. When using, only warm slightly to avoid curdling. For commercial purposes protein milk is desiccated and sold in the form of a powder. This product has the same effect as the freshly prepared protein milk.

Tumor of the Brain.—SPILLER (*Arch. Neurol. and Psychiat.*) reports a case of a boy of twelve years of age who was operated on and there was found a telangiectasis, which was congenital. He was benefited by the operation. Spiller says that it is interesting to note that this boy with the telangiectasis of the cortex had pronounced associated movements, and developed convulsions which were not Jacksonian, but involved both sides of the body. Probably these convulsions, like the voluntary and associated movements, originated in the right motor cortex. The loss of stereognostic perception of the right hand might be attributed to the lesion of the left parietal lobe. The diminution of the right side of the body and limbs was in association with the motor tract from the left cerebral hemisphere. It is common to find arrest of muscular development in the paralyzed side in early acquired or congenital hemiplegia, and the author says that this is dependent on a defect of motor supply of the corresponding side. At birth the muscle may be developed independently of the motor nervous system, but at a very early period of extra-uterine life the motor nervous system takes hold and defect of the former leads to defect of the latter.

The Etiology and Treatment of the Diarrheal Diseases of Infancy.—HILL (*Jour. Am. Med. Assn.*, 1919, lxxii, 1653) rather definitely divides the diarrheas according to etiology and treatment, reflecting the teaching of the Boston School of Pediatrists. Any diarrhea is caused by increased peristalsis. This increased peristalsis is caused by some irritant acting on the intestinal mucous membrane, and it is best to classify diarrheal conditions according to the type of irritant causing the trouble: (1) mechanical diarrhea, due to mechanical irritation; (2) fermentative diarrhea, due to chemical irritation; (3) infectious diarrhea, due to bacterial irritation. In the first group the irritation is mechanical and is caused by undigested pieces of food or by such things as fruit-skins or seeds. In the second group the trouble is caused by irritating products from the fermentation or putrefaction of food in the intestine. There is no infection by bacteria of the intestinal mucous membrane in this condition; it is the intestinal contents that are infected. In the third group there is actual invasion of the intestinal mucosa by bacteria, with catarrhal inflammation or often actual ulceration. The treatment of mechanical diarrhea consists simply in purging the child with castor oil or calomel, putting it to bed, giving it barley water or some other gruel for twelve hours, with plenty of water, and then starting it on a bland non-irritating diet of cereal and boiled skimmed milk. This is the simplest and least important of the infantile diarrheas. Fermentative diarrhea is caused by sugar or protein. In mild sugar fermentation a purge is not necessary unless the baby has fever. All sugar should be omitted from the milk modification and the solution boiled for three minutes. One teaspoonful of compound chalk mixture should be added to each bottle. In two or three days the baby will be back on its regular modification. In the more severe forms Hill recommends albumin, milk, skimmed milk with powdered casein, lactic acid milk, or in out-patient work skimmed milk dilutions alone. It is a mistake to give a purge as a routine. It is not rational to purge a baby who is already having a great many loose stools a day. On the other hand a baby who is seen at the onset, who

has fever and who has not as yet been emptied by diarrhea ought to be purged at once. Colon irrigation at the onset may do a great deal of good. The free administration of water is of the greatest importance. When air hunger develops sodium bicarbonate should be given at once by mouth, subcutaneously or intravenously. Compound chalk mixture is of value in many cases, and in the fermentative diarrheas does more good than bismuth. As to opium we should not slavishly follow a set rule and refuse to give it in all cases. The stimulants brandy and caffein are often needed. In the more uncommon protein form of fermentative diarrhea the stools are brown and foul instead of being green and acid smelling, as in the sugar form. Here a low protein and a fairly high carbohydrate diet is needed. Infectious diarrhea may arise in a number of ways, the most common one being direct infection of the mucosa by dysentery bacilli taken per os. The streptococcus and the Bacillus aërogenes capsulatus are probably etiological agents also. The general treatment is the same as that for fermentative diarrhea, which has been outlined. The feeding is quite different. As regards diet, cases of infectious diarrhea must be divided into two groups: The first group includes cases caused by the dysentery bacillus or more rarely by the streptococcus. The second group of cases is caused by the gas bacillus. The gas bacillus cases should be fed on a lactic acid milk with a low sugar while the dysentery ones should receive low protein and high carbohydrate.

Autoserum Treatment of Chorea.—Brown, Smith and Phillips (*British Jour. Children's Dis.*, 1919, xvi, 8) again bring up the subject of autoserum treatment of chorea, originally proposed and used by Goodman. They describe the technic and call special attention to the importance of suspending drug therapy for five days previous to the injection. Their results are: autoserum therapy has been productive of infinitely more satisfactory results than any other method of therapy, a cure of 77 per cent. of the cases being effected within three weeks' time. There have so far been no recurrences in a period of over a year and a half.

OBSTETRICS

UNDER THE CHARGE OF

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Extraperitoneal Cesarean Section in Infected Cases with the Carrel After-treatment.—Markoe and McPherson (*Surg., Gynec. and Obst.*, August, 1918) limit the use of the extraperitoneal operation to cases in which the child is living and the patient who is presumably infected and cannot be delivered of a living child through the normal passages. These conditions contra-indicated craniotomy or other vaginal interference for the maternal mortality of craniotomy in the lying-in hospital

was 12.5 per cent., with a fetal mortality of 100 per cent. The writers believe that it is virtually impossible to have the peritoneal cavity open and not to infect it when the septic contents of the uterus must necessarily invade everything in the immediate surroundings when the child and placenta are removed. Markoe has performed 5 transperitoneal operations: 1 for the toxemia of pregnancy, 1 for justominor pelvis, 1 contracted pelvis, with a history of interference before admission, 1 with contracted pelvis, with repeated efforts for three days to deliver, and 1 with a history similar to the preceding. McPherson also performed the operation of extraperitoneal section with fairly satisfactory results. With the advent of the Carrel-Dakin method it seemed possible to rapidly sterilize these wounds and thus secure more prompt and perfect union, and the writers believe that the extraperitoneal section with the Carrel-Dakin method may be employed in patients in whom the child is living, but when the mother is infected and cannot be delivered of her child by the natural passages. The advantages of the operation are the avoidance of sepsis; the disadvantages are the fact that the operation is not easy and that injury may occur to surrounding tissues. The objections lie in the fact that the operation is not simple and in inexperienced hands may prove formidable. The operation is not one to be adopted by the general practitioner but by those with hospital facilities and surgical experience.

Obstetrical Anesthesia during Labor.—PALMER (*California State Jour. Med.*, 1918, No. 16) gives his results in the use of nitrous oxide and oxygen in the clinic of the Stanford University Medical School. It was found that substance does not delay labor in the second stage and that it may be so given as to shorten the duration of labor or the use of forceps. The continued administration of nitrous oxide and oxygen, or a moderate degree of anesthesia is best, using a small quantity of ether as the child is delivered from the perineum to secure relaxation. It is best not to secure relaxation by decreasing the amount of oxygen given, as this is always dangerous and especially so in obstetrics. If greater relaxation is desired than is ordinarily given by gas the addition of ether is safer. In version and in any operation when it is especially desired to secure relaxation gas with ether or ether and oxygen made the best combinations. The use of nitrous oxide and oxygen seems to have no effect upon the occurrence of postpartum hemorrhage. It tends to prevent lacerations and may be employed in suitable cases in the performance of Cesarean section. It was found that the cost of the gas necessary for a case was $2.50, and that if the patient would pay that it would reimburse the hospital for the expense.

The Effect of Placenta on the Growth of the Fetus and the Newborn Child.—HAMETTE (*Jour. Biolog. Chem.*, December, 1918, No. 36) conducted investigations to ascertain whether the use of desiccated placenta to nursing women would have an effect upon the chemical composition of the milk, whether it would improve the nutrition of infants so fed. He found that, aside from any change in the constituents of the milk, the administration of placenta to the mother stimulated the growth of the child. These patients were given 10 grains of desiccated placenta three times daily. Only those were selected who had normal

labors and only those children were studied who were fed exclusively by the mother. The mother's diet and the methods of keeping track of the infants were those which the observer had previously employed with success. The results were striking and apparent. In each child there was much less loss of weight after birth. The gain in weight was more rapid and the gain in daily weight was unusually large. By the thirteenth day the child had gained 60 per cent. over its original weight. There can be no question concerning the accuracy of the observation, as the results were so striking that they could be ascribed to nothing else. It was found that the infants thus fed had a greater capacity for growth than those whose mothers were not so treated. Very careful comparative measurements were taken of the breasts in a large series of cases in the women who were taking desiccated placenta and those who were not. The time when the milk came in full was accurately noted in these cases and it was found that there was no essential hypertrophy of the gland or increased milk production. The conclusion is reached that desiccated placenta contains some substance or substances which pass through the maternal body, retaining their active properties; passing into the child's body through the milk these substances stimulate the growth of the infant.

Obstetric Science and Art in the Service of the Nation.—Davis (*Jour. Am. Med. Assn.*, December 7, 1918) calls attention to recent discoveries which have improved obstetric practice and some dangerous tendencies at the present time. Among these he especially draws attention to the abuse of pituitrin. The treatment of puerperal septic infections by vaccines and sera, while it has not proved of great value, still may be in the future more efficient. There has been great improvement in our knowledge concerning the toxemia of pregnancy and the recognition of the fact that pernicious nausea and vomiting depend upon that cause. In obstetric surgery especial gains have been made which are already doing much to make the mother's recovery from labor complete and to rescue her from becoming an invalid. When, however, the general field of obstetric practice is investigated it is found that there is great room for improvement. The trouble lies in the circumstance that careless and sometimes ignorant and unscrupulous physicians continue to undertake complicated and difficult deliveries without adequate assistance and in the most unfavorable surroundings. The multiplication of maternity hospitals, good roads and motor cars make it possible in many cases to remove the patient promptly to the hospital. Improvement in medical education, especially among students, should lead to the prompt recognition of serious complications and the avoidance of inefficient efforts to deliver the patient by inadequate means. There are many interesting problems in obstetrics still remaining for solution, among them the importance and varying manifestations of infection by the Bacillus coli communis. It has been abundantly proved by clinical observation that the pregnant patient is especially prone to this complication and that it may affect the appendix, the gall-bladder or the kidney. There will be no essential diminution in the mortality and morbidity of puerperal septic infection until complicated cases of obstetrics are considered as important, as dangerous and as imperative as appendicitis, infection of the gall-bladder or other acute and serious

abdominal conditions. If the general practitioner would abstain from fruitless efforts to deliver in such cases and promptly summon competent obstetric aid the lives of many mothers and children would be saved. The importance of maternity hospitals can scarcely be overestimated in this regard. In the present condition of the world it is of the greatest importance that a sound and vigorous population be given to the United States. Hence the value of improvements in obstetric education and practice.

An Operation for the Relief of Pyloric Obstruction in Infants.—CUPLER (*Surg., Gynec. and Obst.*, August, 1918) describes his operation as follows: The stomach is emptied, ether given, incision made along the upper right rectus splitting the muscle. The tumor in the stomach is then delivered and held firmly between the thumb and index finger and a longitudinal incision, 2 or 3 cm. in length, is made through the serosa and circular muscle fibers down to the thickened mucosa. After the muscle is divided the observer can detect a definite line of cleavage between muscle and mucosa. Blunt forceps, or small retractors, may be used to spread the incision apart. If the muscle be freed just sufficiently the mucous membrane will protrude into the wound. There is very little hemorrhage. Occasionally a small vessel will require ligature. Usually the application of a warm pad to the wound edges will control the oozing. In spreading the incision it is best to start at the stomach end of the incision, as here the merging of the stomach wall into the pyloric tumor is a gradual process and but little danger of entering the mucosa; whereas, the change from the thick and edematous pylorus to the neighboring duodenum is so sudden as to cause us to avoid opening the intestine at this point. The serosa is freed from the muscle enough to allow coaptation of the edges without tension, and this permits the muscle to remain in a supported position. The serosa is then brought together by two or three sutures. This operation differs from the Ramstedt procedure only in the fact that the serosa is made to cover the mucosa Ramstedt's experience shows that there need be no fear of leakage and peritonitis. The wound should be closed in layers without drainage. The skin closed with linen, the abdomen reinforced by the application of a wide circular adhesive band. The postoperative care consists of early feeding 2 or 3 drams of diluted milk four or five hours after the operation. One to three ounces every four hours on the third day. Overfeeding is to be avoided, for edema at the operative site may occur and the symptoms return. Withdrawal of food and gastric lavage will usually correct the condition. Hypodermoclysis is often needed. The writer has employed this method in two cases. Downes describes the postmortem findings of an infant dying of endocarditis three months after a successful Cesarean operation. In this case the stomach removed showed an elliptical cicatrix on the anterior surface of the pylorus about half the size of the original wound. This area was covered with serosa and appeared to consist of serosa and mucosa only.

A Method for Determining the Maturity of the Fetus in Utero.—THOMS (*Surg. Gynec., and Obst.*, May, 1918) examines a patient to determine the maturity of the fetus by making the usual vaginal examinations, passing one or more fingers to the cervix, and if the vertex

or breech is in the birth canal it may be easily palpated through the anterior fornix. If the presenting part is too high up, slight pressure upon the fundus toward the symphysis will bring the presenting part down so it may be palpated. With the examining hand in position the finger resting against the fetal head and in a line corresponding with the longitudinal axis of the fetus, an assistant measures with the pelvimeter the distance from the uppermost point of the buttocks through the abdominal wall to any easily available point on the examining hand outside the vulva. The index finger of the other hand of the examiner is now placed at the point against the tip of the pelvimeter. The reading is made, and with the finger-tip of the non-examining hand still in position the examining hand is withdrawn from the vagina. The distance from the tip of the examining finger to the point where the pelvimeter rested is now measured. This reading subtracted from the former reading will give the distance from the vertex to the uppermost point of the buttocks after subtracting a small amount for the thickness of the abdominal and uterine walls. If the examining finger has rested against the fetal head itself through the patent cervical canal it is the custom of the writer to deduct 1.5 cm. before multiplying by 2. If, however, the palpation has been made through the anterior fornix, either rectally or vaginally, 2 cm. are deducted. Up to the present time in cases where measurements have been made before and after birth results have been gratifying. The employment of the rectal route is obvious and requires no further description. The length of the floated child *in utero* may be determined with greater accuracy in this way than in external abdominal methods. This method is deserving of wider use, no special instruments being required. It is rapid and conflicts in no way with asepsis.

The Clinical Types of Puerperal Fever with Reference to Prognosis and Treatment.—Watson and Scott (*Canadian Med. Assn. Jour.*, 1918, No. 8) have studied obstetrical and gynecological patients with regard to the occurrence of puerperal septic infection. Among 2096 puerperal cases there were 476, 22.9 per cent. showing morbidity. From the gynecological service there were 97 cases which could be traced to puerperal septic infection. A thorough investigation of these patients showed that in 85 per cent. of cases developing fever after childbirth the fever quickly subsides without the development of any definite pathological lesion. When a definite pathological lesion does develop it is not apparent for some time after the first rise of temperature. In the pelvis the infection starts as a wound infection of some part of the genital tract. This primary infection may remain localized for varying times or may spread by contiguity by the blood stream or by the lymphatics. When the infection spreads by contiguity of tissue, pus tubes, pelvic peritonitis or general peritonitis develop. The organisms usually found in these cases are the gonococcus and streptococcus. Lesions due to the gonococcus appear late in the puerperal period and are less severe than those caused by the streptococcus which appear early. When the infection spreads by the blood stream it is usually of the thrombophlebitic type, beginning in the thrombosed veins of the placental site. But this may occasionally rise from a primary infection in the perineum or vagina. When infection spreads

by the lymphatics it gives rise usually to cellulitis or to a septicemia. This is especially serious and often results in death. It does not seem to be the type of organism which determines the severity of the infection as the situation in which that organism is growing. At present we have no means of treating primary infection of the uterus without favoring the extension of the inflammatory process to the surrounding tissues and the blood stream. Therefore all cases in the early stages should be treated expectantly. When a distinct pelvic lesion does develop it should be dealt with on surgical principles. Puerperal sepsis is the same whether the sepsis follows labor or follows abortion.

The Abuse of Pituitary Extract in Obstetric Practice.—MARCHAND (*Boletin de la Asociacion Medica de Puerto Rico, San Juan*, 1918, No. 14) relates that midwives in Porto Rico have learned the use of pituitrin and use it blindly in all sorts of obstetric cases. As a result lacerations and other complications of labor are becoming frightfully common. The sale of this drug should be restricted and it should not be placed in the hands of ignorant midwives. A recent case is described in which a primipara was given four injections of pituitary extract. When seen the woman was moribund, lying in a pool of blood, with an inverted and relaxed uterus exposed to view. In another case Marchand had time to reduce the uterus and combat the collapse which followed a terrific hemorrhage. This primipara had three injections when the cervix had scarcely begun to open. Judicial reprimand of the midwife who had charge of such a case does little good. Even in the hands of experts pituitrin is a drug which must be used with great caution. It was urged that restrictions similar to those placed on the sale of narcotics should also be enforced concerning the sales of pituitary extract.

A Case of Abdominal Pregnancy at Term.—NOBLE (*Am. Jour. Obst.*, December, 1918) reports the case of a woman, aged forty-two years, the mother of one child, three years old. As the time for her period passed the patient introduced into her uterus a catheter to bring on menstruation. After this she had at first a bloody and then a purulent discharge. She was in the hospital violently ill, with a temperature of 104°, and abdominal pain, sweating, vomiting, distention and loss of weight. She was said to be too ill for any operation, but finally improved and was able to leave the hospital and to change her residence. She continued to have a purulent discharge from the uterus and consulted physicians, who made various diagnoses. When she consulted the writer she was still having purulent discharge from the vagina. She had recovered her general health, had gained in weight, but sometimes suffered from severe abdominal pain, lancinating in character, usually occurring at night, referred to the lower abdomen and in varying location. Normal menstruation did not return. No blood had been discharged from the uterus since a short time after the introduction of the catheter. The abdomen was diffusely enlarged and no well-defined mass could be made out. On vaginal examination there was a mucopurulent discharge. The vaginal wall was dark in color, raised in temperature and boggy on palpation. A hard, globular body was felt just above the perineum behind the posterior vaginal wall, crowding the cervix so far upward that it could not be felt. By careful examination it could be made out

that this was the head of a living fetus. Under rest, restricted diet and elimination from the bowel abdominal pains ceased and the general health had improved. She was then allowed to go home and told to return as nearly as possible at the latter end of the pregnancy. Abdominal section was then performed. The amniotic sac lay beneath the abdominal wall, through which could be plainly seen a vigorous fetus. The omentum and transverse colon were across the upper border of the sac and adherent. There were no adhesions between the amniotic sac and the anterior abdominal wall. An effort was made to separate the omentum and transverse colon from the amniotic sac, but the attempt resulted in rupture of the sac. A vigorous well-developed female child was delivered and cried as soon as born. The cord was tied and cut and the membranes were adherent to the omentum, transverse colon, intestines and mesentery. The placenta was very large and was attached to the mesentery of the sigmoid, the posterior aspect of the broad ligament and the floor of the pelvis. The placenta was removed until the broad ligament was reached, when a hysterectomy was performed. The mesentery was ligated and removed where the placenta had been attached, and the appendix was also removed and the abdomen closed without drainage. The mother recovered without incident and nursed her child.

Fetal Deaths during Labor.—REED (*Surg., Gynec. and Obst.*, May, 1918) finds that out of 100 infants from 4 to 6 die during labor, or soon after, as the result of parturition. Some perish from a maternal or fetal disease of a definite character like syphilis or hemophilia, injury to the brain or pneumonia. But excluding these asphyxia is the most usual cause of death. This may be described as a condition of the infant in which there is no sign of life except the beat of the heart. It is not a pulselessness in the ordinary sense of the word, but a lack of the function of respiration. One can readily understand that this may follow coiling of the cord about the child's neck or pressure from any source upon the umbilical cord. So long as the membranes remain unruptured the danger to the infant is extremely slight, but after the membranes rupture immediate danger is present. The force of uterine contraction is sufficiently great to cause decided pressure upon the child and also to interfere with the exchange of oxygen between mother and child. The longer the contraction and the shorter the intervals between them the greater is the child's danger. Intra-uterine pressure is such that if a column of mercury stood at 80 before the rupture of the membranes it rises to 150 or more afterward. If presentation and position are abnormal some parts of the uterus are under greater pressure than others. This alters the blood supply and oxygen starvation begins with retention of carbon dioxide in the fetal blood. Compression of the cord or placenta may also occur, and if the placental site is unusually soft and spongy it may be contracted to a dangerous degree. The fact that the uterus reduces its volume may also influence the child unfavorably. The soft parts of the birth canal also expose the child to danger from unusual pressure, and this is especially marked in the first labor. It is estimated that there are three times as many stillbirths among primipara as among multipara. So too a very large child will add to the dangers of mother and infant. So the age of the mother (over

thirty) and the sex of the child (male) may also be unfortunate factors. The prolongation of labor is a distinct danger to the child. This may be inferred from the fact that when the labor goes beyond one hour in the primipara the fetal mortality is 8 per cent. Should labor be over two hours the mortality rises to 18.3 per cent. In a large series of cases in which the labor lasted two hours or more 18.32 of the cases were born asphyxiated, 1.7 per cent. were stillborn and 5.5 per cent. died later. Among the four-hour cases 49.65 per cent. were asphyxiated, 5.59 per cent. were stillborn and 6.22 per cent. died during the next few days. Obviously vertex presentations are least dangerous and transverse are most dangerous, with a mortality of 39 per cent. Statistics indicate that a face presentation was a little more than one-half as dangerous as a breech, 13.21 per cent. respectively. The fetal mortality of breech presentation should be remembered in selecting methods of delivery. In breech cases the cord is compressed, the child's mouth is surrounded with amniotic liquid or buried in the soft tissues of the mother's body. Under these circumstances the child becomes asphyxiated in a few minutes and will die in from eight to ten minutes, for immediately the umbilicus passes the vulva the cord is compressed between the pelvic brim and the head and shoulders, and hence the child must be promptly delivered. In vertex presentation great care must be taken to guard against excessive compression as well as delayed labor. Paralysis of the inspiratory or respiratory center may occur while the child has a good heart-beat at birth and a good circulation, but cannot be brought to breathe. So-called "blue babies" from partial asphyxia gives the better prognosis, for the reflexes are not yet lost. In pallid asphyxia the muscle tone has disappeared and the child's heart-beat is feeble and irregular. The stage of irritation of the pneumogastric nerve has been succeeded by that of paralysis. Male children suffer more often from asphyxia than female, probably because of the greater size and also the fact that there are more male infants than female. Contracted pelvis is an evident cause for the death of the fetus in labor. The use of forceps usually results in cerebral compression to some degree, and this can be demonstrated if the stethoscope be applied while traction is made. Coma and edema of the lungs in the motor spasm of the respiratory muscles, premature separation of the normally implanted placenta and placenta previa all cause fetal death. The fetal mortality of placenta previa is at least 50 per cent., while in separation of the normally implanted placenta only 1 in 15 survive. The question of the influence of anesthetics upon the unborn child is one of considerable interest. Unless anesthesia be deep and prolonged there need be no essential harm to the child. Gas and chloroform are more dangerous than ether under ordinary circumstances. The intermittent use of gas is possible for some time without injury to the child. This is probably true to less extent of ether and chloroform. So far as twilight sleep goes, like other methods the results depend largely upon the way in which it is done. Any anesthetic continuously administered for a long time will certainly injure the fetus. Any anesthetic may be skilfully used at short intervals for a moderate time without danger of a fatal result. Pituitrin has undoubtedly caused the death of many children and can safely be used only under certain circumstances. Its indiscriminate use is exceedingly dangerous. We recognize

the fact that death of the fetus may follow inspiration of amniotic liquid, meconium or vernix caseosa. The diagnosis of fetal death before delivery may be difficult. Fetal heart sounds give the best information pertaining to the state of the child. During the second stage the heart sounds should be counted at frequent intervals and observed before, during and after pain to be sure that the normal rhythm is present. When the heart-beat is greatly lessened or increased there is danger to the child. Pituitrin causes reduction in the heart-beat, but when small doses only are given the heart resumes its normal condition. Slowing of the beat, increased rapidity and irregularity are positive signs of danger. Slowing is most common and usually caused by carbon dioxide intoxication or by acidosis, which irritates the pneumogastric nerve. It is of importance only when it persists during the interval between pains. If the pulse sinks below 100 in the interval there is danger and labor should be terminated. In the further stage of involvement the pulse is 160 or more to the minute. This indicates positive danger to the infant. In the third degree the heart beat is irregular, which means threatened paralysis of the pneumogastric. When the variation exceeds 50 beats, interference should be attempted in the interests of the child. When the heart-beats cease, obviously fetal death has occurred. If proper antiseptic precautions are taken, or if the assistant, who is accustomed to do so, listens to the heart-beat of the fetus, there can be no objection to frequently listening to the heart-beat during labor. Pituitrin should never be given in doses larger than 10 minims and the child's heart-beat should be watched after this dose. Care in the use of anesthetics will also prevent fetal mortality and prolonged anesthesia must be avoided. The rebreathing of gas should not be permitted in the interests of the child. If the woman is toxic or has high blood-pressure, neither gas nor chloroform should be used. If morphin-scopolamin is given the patient must be at least three hours away from the end of her labor. From 10 to 15 per cent. of infants born in asphyxia die during the next eight days. This result occurs from atelectasis, convulsions, paralysis, pneumonia or some congenital condition which prevents the readjustment of the child's vital forces after birth.

Prevention of Gas Pains after Obstetric and Other Operations.—EMGE (*Jour. Am. Med. Assn.*, September 14, 1918) calls attention to what he believes to be a wrong conception illustrated by preparatory purgation before operation. His arguments apply with equal force not only to surgical operations, but also to parturition. He does not believe that the patient is put in good condition by starving and purgation. Various authorities are quoted expressing the belief that such preliminary treatment is harmful. It is interesting to note what happens in emergency operations. In emergencies such as tubal pregnancy or Cesarean section patients do well who have not been subject to preliminary purgation. In spite of the fact that these patients must be operated on in haste they have no more complications after operation and oftentimes less disturbance than those who have been prepared by purgation. It will be remembered that in operating upon patients who have not been purged that the intestine is usually less distended, does not escape from the abdomen so readily and is far more easily handled

than in patients who have been thoroughly purged before operation. Experiments on animals have shown that disturbance of the portal circulation interferes with the absorption of gas. This is an important point, because active purging in preparation for operation. When, however, the mesenteric circulation was absolutely at rest the formation of gas was comparatively little. A comparison is made of patients who had been treated before labor or operation by active purgation and those who had not. The best results with patients were observed in those who had no purgation prior to labor or operation, but received a cleansing enemata just before the operation. It was also seen that patients who had been prepared by purging before labor or operation had gas pains and cramps much more frequently than those who were not so prepared. These observations may be summarized by the statement that purging before labor or operation has much to do with producing gas pains. Should it be necessary to open the abdomen in delivery it will be found that the intestines in patients who have been purged are much more distended and difficult to control. Enemata will clear the lower bowel sufficiently for all practical purposes.

GYNECOLOGY

UNDER THE CHARGE OF

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Permanent Rectal Cloaca.—A case in which for over thirty-five years a woman defecated and urinated and for eleven years menstruated by the rectum is worthy of a final record as an evidence of the possibilities of surgery and especially of the conclusive evidence it affords that the rectum can be utilized as a common cloaca for the urine and the menstrual flow as well as for the feces for an indefinite period. The condition necessitating this novel use of the rectum was a case of extensive and incurable vesicovaginal and rectovaginal fistulæ caused by sloughing as a complication of typhoid fever. The patient was a woman, thirty-five years old, who first came under the observation of KEEN (*Ann. Surg.*, 1919, lxix, 606) in 1873. In 1872 she nursed her husband in a fatal attack of typhoid fever and then fell ill of the same disease. About the fourth week the labia minora sloughed away and both urine and feces escaped through the vagina. Six unsuccessful attempts were made to close the fistulæ by plastic operations, and in 1875, being convinced of the impossibility of success, Keen proposed to her the absolute closure of the vagina, leaving the fistulæ wide open, which she at once accepted. The operation was a success except at the

anterior end of the cicatrix, which held everywhere else but failed at the internal end of what was left of the urethra, the vesical end of which had sloughed away. Several minor but always unsuccessful operations were done here until finally he excised this small end of the urethra. This was her twelfth operation and was entirely successful. After the operation fistulæ in the cicatrix broke out in 1877, 1896 and 1904, usually causing only a little leakage and only when in the erect posture. Once the fistula healed spontaneously, once after a minor operation and the third time after several small pockets were emptied of urinary concretions. At the date of her death in 1911, at the age of seventy-three years, she had remained dry and well, with the exception noted for over thirty-five years after the closure of the vaginal outlet. During all this long period she urinated only once or twice at night and five or six times during the day. No ascending renal, vesical or uterine infection occurred at any time nor did the mucous membrane of the rectum at any time resent the constant presence of the urine or the periodical presence of the menstrual blood.

Tuberculosis of the Cervix.—While tuberculosis of the cervix is very rare indeed, undoubtedly many cases have been diagnosed early cancer, syphilis, etc., without histological study, and MOORE believes (*Surg., Gynec. and Obst.*, 1919, xxix, 1) that many cases of early cancer of the cervix diagnosed from the clinical symptoms, which have recovered spontaneously or after conservative operations, were tuberculous. Primary tuberculosis of the cervix is an extremely rare disease and probably not more than 15 to 20 cases have been reported. As primary infections, we should include only those cases in which the cervix is the only organ involved. When other distant organs are involved it is impossible to rule out a hematogenous infection even though infection by an external route seems plausible. Of the secondary tuberculous infections of the cervix, probably about 150 cases have been reported. The portal of entry in these infections is quite variable, although hematogenous infection is the most common means of attack. The next most common route of infection of the cervix is by direct extension of a tuberculous process from the tubes, ovaries or uterus or by secretion from these organs passing over the cervical mucosa. External means as a method of infection of the genital organs have been a subject of much interest to investigators of these lesions. The most frequent method by which bacilli are brought in contact with the female genitalia from external sources is by coitus. The other means are by handling with unclean gloves, hands or instruments in making examinations. There are four different varieties of lesions of the cervix commonly mentioned, and two others that occur in very rare instances. These are classified according to their anatomical and microscopic forms: (1) miliary, (2) interstitial, (3) vegetating, (4) ulcerating, (5) catarrhal form of Schutt, (6) inflammatory form of Cotte. In the majority of cases all types begin in the cervical canal, only occasionally on the vaginal portion of the cervix. In the later stages all types of lesions develop into the ulcerative form resulting in a purulent vaginal discharge and more or less hemorrhage. The microscopic appearance of tuberculosis of the cervix depends upon the stage of the disease and the type of lesion. Tuberculous follicles may be isolated or confluent in

different stages of evolution, accompanied by an intense inflammation. The process is often found extending along the course of the vessels, with involvement of the deep intermuscular tissues causing necrosis of muscle bundles. The glands often undergo hyperplastic changes, the cells becoming enlarged and the secretions abundant. Tuberculous infiltration may develop in the interglandular spaces, blocking up the neighboring glands so that they appear as solid columns of cells. Retrogression changes finally occur, resulting in necrosis and caseation. Giant cells are rarely found in the glands proper. During the earlier stages the glands may become papillary, polypoid or dendritic, resembling carcinoma or the glands and stroma may hypertrophy, resembling adenoma. The most common symptom is leucorrhea. In the early stages the discharge is slight, mucopurulent and inoffensive. During the later stages, as ulceration increases, the discharge becomes profuse, purulent and very offensive, and in rare cases is tinged with blood. Slight bleeding after coitus is a fairly frequent occurrence, and this is what brings the patient to examination. In the very late stages there may be considerable blood in the discharge, but this differs from the watery, blood-stained discharge of carcinoma, as it is purulent and offensive. Clinically the diagnosis is always difficult, as all stages of the disease resemble carcinoma, and a specimen for microscopic examination should be taken in every case, and owing to the similarity in microscopic appearance, it will be necessary to resort to guinea-pig inoculations in certain cases, while the coexistence of carcinoma and tuberculosis should not be forgotten. The final decision of the method of treatment in a given case should be made only after a careful consideration of the patient's general condition. If there is an active process elsewhere in the body, excision of the local process will be of no benefit. If the patient desires to have children, and the general physical condition will permit it, a conservative operation should be done, provided that the uterus and tubes are not extensively involved. If the question of child-bearing is not to be considered, panhysterectomy should be done whenever there is reason to believe that the uterus or tubes are involved. The prognosis depends entirely upon whether there are active lesions in other parts of the body and on the complete eradication of the local process. In cases with pulmonary involvement, the prognosis is always grave. When the process is definitely localized in the cervix, simple amputation gives good results, or if localized in the generative organs alone, panhysterectomy will effect a cure; but if there is extension to the vaginal walls or the pelvic peritoneum, there is little hope of cure.

Vaginal Hernia.—Judging from the very few cases reported, vaginal hernia must be of extremely rare occurrence, and for this reason SWEETSER (*Ann. Surg.*, 1909, lxix, 609) has reported a case that has come under his observation. Clinically the case resembled the ordinary rectocele, but under anesthesia, examination of the rectum revealed the fact that it was not prolapsed and took no part in the formation of the swelling, and upon careful dissection the tumor wall was found to be peritoneum, which was very thin but easily separated from the anterior rectal wall. The sac was opened and some clear yellow fluid drained away, but no coils of bowel appeared, which was due to the fact that the omentum was adherent to the upper wall of the hernial cavity as a result of an old

inflammatory disease. The abdomen was opened and the hernial opening the pelvic floor was closed by sutures which included the sacro-uterine ligaments. The sac was excised and the vaginal incision closed. As regards diagnosis, these herniæ have been mistaken for prolapse, for vaginal cyst and for abscess, and several have been operated upon under such mistaken diagnosis, the gut being incised or even excised with fatal results. It is therefore well to bear in mind that such herniæ do occasionally occur.

The Menopause.—Although this article was written by NORRIS (*Am. Jour. Obst.*, 1919, lxxix, 767) ten years ago and published at that time, at the request of numerous subscribers, the publishers have again printed it, and on account of the extreme importance of this subject a brief abstract is deemed worthy of consideration. Norris has made a very careful study and analysis of 200 apparently normal cases in order to determine the exact character of a normal menopause, concerning which there has always been so much mystery and confusion. His conclusions are that menstruation being dependent upon an ovarian secretion, it is fair to assume that the menopause is due to a change in the ovary, which theory is borne out by clinical facts, histological studies and animal experimentations. The generally accepted statement that the menopause is established at forty-two to forty-five is incorrect, but forty-six to forty-nine is nearer the actual age in the Eastern United States. Among normal women the age at which the menopause appears varies within wide limits, being influenced by many factors: child-bearing, marital relations, good nutrition and hygiene, city life and education prolong the menstrual functions, while converse conditions tend to an earlier menopause. Climate and race undoubtedly play a definite part in the age at which the menopause occurs, but are probably of secondary importance in the United States. Hereditary influence is in many cases a potent factor, since in some families the menopause occurs early, in others late. In the majority of cases the chief feature of the menopause is not the cessation or diminution of bleeding, but the neuroses which frequently antedate any change in the menstruation may continue for six to eighteen months after the final cessation of bleeding. The actual bleeding is, however, the barometer of health and normally the menopause is established without an increased loss of blood. When menorrhagia occurs an examination is indicated, while metrorrhagia should always be viewed with suspicion. In about 90 per cent. of absolutely healthy women the menopause occurs normally, but among average women fully 30 per cent. present symptoms which call for a careful physical and gynecological examination. All women at the menopause should be under the observation of a physician, since care of the cases at this time will result in the menopause being established with less discomfort to the patient and many malignant neoplasms will be diagnosed earlier than would otherwise have been the case.

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The Precipitin Test for Blood in Feces.—HEKTOEN, FANTUS and PORTIS (*Jour. Infect. Dis.*, 1919, xxiv, 482) studying the precipitin test as applied to human feces, using antihuman rabbit serum, reported very limited value of this test as compared with chemical tests. They believe that the only practical value of the precipitin test for human blood in feces could be in cases giving a negative precipitin test and a positive reaction with the Weber or benzidine tests, as the negative result would indicate that the positive chemical tests were probably due to some other factor than human blood.

A Functional and Pathological Study of the Chronic Nephropathy Induced in the Dog by Uranium Nitrate.—In 1888 Chittenden and Hutchinson reported their observations on the production of an acute nephropathy by uranium salts. Subsequent observations have dealt largely with the type of the pathological response on the part of the kidney and the processes of repair which take place in the kidney during its recovery from the acute injury. MACNIDER (*Jour. Exper. Med.*, 1919, xxix, 513) undertook an investigation to study the functional capacity of the kidney during the period of the acute injury from uranium and also when the kidney is recovering from the acute degeneration and passing into a stage of chronic injury. Observations were also made of the changes in the acid-base equilibrium of the blood of these animals both during the period of acute injury and the stage of repair. Twenty-seven female dogs, varying in age from five months to ten and a half years, were used in the experiments. The author's studies confirm the work of Dickson, who demonstrated that uranium would produce in certain of the lower animals a chronic kidney injury comparable with certain of the chronic diffuse nephropathies of man. The severity of the acute degenerative changes in the kidney is largely dependent upon the age of the animal. The older animals develop a more rapid and severer type of intoxication than the younger ones. The intoxication is characterized by a reduction in the alkali reserve of the blood and by the development of a kidney injury. The injury is expressed functionally by the appearance of albumin in the urine, a reduction in the elimination of phenolsulphonephthalein and by a retention of blood area. All animals intoxicated by uranium have shown a disturbance in the acid-base equilibrium of the blood, as indicated by a reduction in the alkali reserve and by a decrease in the tension of alveolar air carbon dioxide. In the younger animals when an attempt at repair takes place the depletion of the alkali reserve of the blood is in part restored, and with the regeneration of epithelium in the younger animals the functional

capacity of the kidney improves. Repair in these animals leads to the development of a chronic diffuse type of nephropathy in which the acid-base equilibrium of the blood may be maintained at the point of normality.

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Narcotic Drug Addiction as Regulated by a State Department of Health. — BLAIR (*Jour. Am. Med. Assn.*, 1919, vol. lxxii, 1441), believes that after sufficient administrative machinery, both federal and state, is developed, the importation and sale of all habit-inducing drugs should be made a government monopoly; that it should be unlawful for any physician to prescribe or dispense any of these drugs in any but the accepted therapeutic dosage under any conditions or to buy or possess them in quantity greater than the legitimate therapeutic needs of his own or institutional practice fully justifies; that pharmacists be prohibited from selling them in any quantity whatsoever, and he be allowed to fill no prescription calling for more than the usual therapeutic dosage; and that no ready-made or proprietary product carrying any narcotic whatever be allowed to be sold. He would have an official, not in medical, pharmaceutical or dental practice, in every district to whom every particle of the government supply for the district should be sent. It would be his duty to estimate the legitimate needs of all professional people and to supply them so much and no more, except in time of public emergency or unusual circumstances. To him should be reported every addict in the district, even inoperable surgical cases, as well as all persons requiring on the testimony of a physician, doses in excess of the usual; and this official would supply to these persons such amounts as would appear necessary, humanely caring for the addicts already made, but sternly refusing to supply new ones except those with diseases which positively demand large doses. This plan would yield definite results and would relieve the physician of an unwelcome class of work that, in the nature of the case, he cannot handle well. Perhaps there would be much medical objection at first, but the plan would probably work so well that the profession at large would soon come to support it most enthusiastically. Certainly it would relieve the profession of a great amount of narcotic bookkeeping and reports, and would control the problem much better than does any existing plan.

Etiology of Yellow Fever. — NOGUCHI (*Jour. Exp. Med.*, 1919, xxix, 547) states that the clinical and pathological features of the yellow fever prevalent in Guayaquil conform with those described by other investigators of this disease as it has occurred elsewhere, both epidemically and endemically. By injecting into guinea-pigs the blood of yellow fever cases occurring in Guayaquil a group of symptoms and lesions closely resembling those observed in human yellow fever were induced in a limited number of instances. Of 74 guinea-pigs inoculated with specimens of blood from 27 cases of yellow fever, 8, representing 6 cases, came down with the symptoms. In the blood, liver and kidneys a minute organism was demonstrated which closely resembles in morphology the causative agent of infectious jaundice (Leptospira icterohemorrhagiæ). The leptospira transmitted from yellow fever cases to guinea-pigs was found to induce similar symptoms and lesions upon further passage into normal guinea-pigs. The leptospira obtained from cases of yellow fever has been given the provisional name of Leptospira icteroides. Noguchi reports studies on the type of disease induced in guinea-pigs, dogs and monkeys by inoculating them (1) with the blood or organ emulsions of guinea-pigs or other susceptible animals experimentally infected with Leptospira icteroides, and (2) with a pure culture of the organisms. The symptoms and pathological lesions induced in guinea-pigs are much more pronounced than those observed in dogs or marmosets. The period of incubation is nearly the same in all three species, seventy-two to ninety-six hours with intraperitoneal or subcutaneous inoculation, and a day or more longer when the infection is induced percutaneously or *per os*. The symptoms and lesions observed in animals experimentally infected with Leptospira icteroides closely parallel those of human yellow fever. The pathological changes occurring in human cases of yellow fever are similar to those induced by inoculation in guinea-pigs and marmosets and in respect to their intensity stand intermediate between those arising in the two animals mentioned.

Experiments on the Mode of Infection in Epidemic Meningitis. — AMOSS and EBERSON (*Jour. Exp. Med.*, 1919, xxix, 605) state that the lower monkeys as represented by Macacus rhesus are resistant to a high degree to infection with cultures of the meningococcus introduced into the general blood. The lower monkeys are less resistant to infection when the meningococcus cultures are injected directly into the subarachnoid space by lumbar puncture. Relatively virulent cultures, which have been passed through several monkeys, acquire the power of surviving in the circulating blood of the monkeys for a maximum period of about seventy-two hours. Nothing has, however, been observed to indicate that the injected meningococci actually multiply in the blood. It has not been found possible to direct the meningococci circulating in the blood into the cerebrospinal meninges of monkeys. In this effort an aseptic meningitis was induced by injecting horse serum, saline solution, or protargol into the subarachnoid space preceding the introduction of the meningococci into the blood. In rabbits the meningococci were able to pass into the spinal fluid from the blood when a physical break in the continuity was made; however, under the conditions of chemical inflammation of the meninges

the rabbit reacted just as the monkeys, and the organisms did not pass. Because of the high insusceptibility of the monkey to infection with meningococcus it is not believed that the experiments throw any new light on the mode of invasion of the body in man by that microörganism. The experiments do not lend any support to the notion that an intraspinal injection of the antimeningococcus serum, early in the course of invasion of meningococcus in man, and possibly at a period at which the meninges do not yet show evidences of inflammation, favor its diversion from the blood stream into the subarachnoid space.

The Effect of Diet on the Healing of Wounds.—CLARK (*Johns Hopkins Hosp. Bull.*, 1919, xxx) states that the length of the quiescent period of wound healing is affected by the diet. It varies from zero in protein-fed dogs to six days in the fat-fed animals. This variation in the quiescent period is more marked in smaller wounds. As a consequence, the date of final healing differs by about five days for the protein- and fat-fed dogs. When the second period, or period of contraction, has set in the rate of contraction is not affected by the diet. It is governed by a variable factor depending on the age of the wound and by a constant factor proportional to the original size—$\frac{R_1}{R_2} = \frac{S_1}{S_2}$ when R_1 and R_2 = rates of healing of large and small wounds and S_1 and S_2 = original areas of these wounds. The beginning of Period III, the period of epidermization, is independent of the size of the wound and the diet. It is determined by the age of the wound. Contraction and epidermization continue together until the wound is entirely healed. After the wound is healed the scar continues to contract until pigmentation sets in. During this latter process it enlarges and reaches a stationary state after pigmentation is complete.

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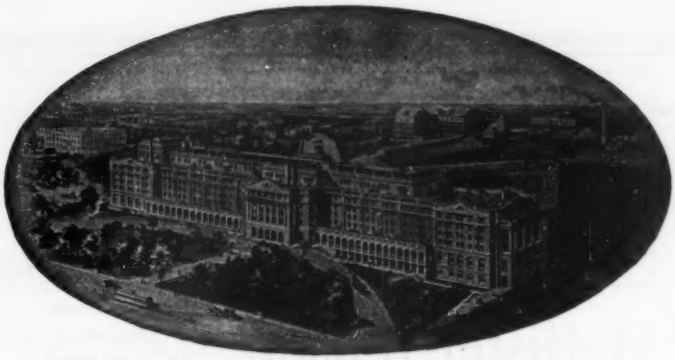

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